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CLINICAL MANUAL FOR THE STUDY OF
DISEASES OF THE THROAT

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MCMIX.

CLINICAL MANUAL

FOR THE STUDY OF

DISEASES OF THE THROAT

BY

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FOR THE FELLOWSHIP, OF THE FACULTY OF PHYSICIANS
AND SURGEONS, GLASGOW

SECOND EDITION

REVISED AND IN LARGE MEASURE RE-WITTEN

WITH 104 ILLUSTRATIONS

GLASGOW

JAMES MACLEHOSE AND SONS

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PREFACE.

THIS is a second edition in name only, for its predecessor has been remodelled, it has been almost wholly rewritten, and brought up to date. A considerable amount of new matter has been added, chiefly as the result of the many important advances in methods of diagnosis and treatment which have been made since the appearance of the first edition.

The book was originally prepared for the use of students and practitioners of medicine and surgery, who desired to gain some knowledge of the diseases of the Fauces, Pharynx, and Larynx, as well as of the means employed in their treatment. While the volume has been considerably increased in size, the same desire to make it a practical guide has been kept constantly in view, and I trust that the book will be received in the same appreciative spirit as was the first.

Some pains have been taken in the subdivision of the subject matter under a sufficient number of suitable headings, in order to facilitate reference, and it is hoped that this feature will prove of service to the reader.

Several new and original illustrations in black and white have been added, and the coloured plates are new. The

majority of the latter are illustrative of conditions frequently met with, while one or two are of rare and interesting lesions, and all have been specially drawn by Mr. A. Kirkpatrick Maxwell and Miss Rhoda Wager from patients under my care in the Western Infirmary. These drawings will, I hope, add considerably to the practical value of the book.

Short notes of several cases are given, where it was thought that the course of the disease, the method of treatment, or the ultimate result, could best be illustrated in this way.

4 WOODSIDE CRESCENT,
GLASGOW, *July*, 1909.

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THIS BOOK IS
RESPECTFULLY DEDICATED TO
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TO HOLD THE HIGH OFFICE OF PRINCIPAL OF
THE UNIVERSITY OF GLASGOW



CHAPTER I.

GENERAL CONSIDERATIONS.

METHODS EMPLOYED IN THE EXAMINATION OF THE MOUTH, FAUCES, PHARYNX AND LARYNX, WITH A DESCRIPTION OF THOSE PARTS.

THE symptoms complained of by a patient suffering from any affection of the throat may vary greatly ; but whatever they are, the examination of the parts should be thorough and systematic. In order that no evidence of disease, which might throw light on the cause of the complaint, may be overlooked, the mouth should, as a preliminary, be examined in all cases, and after the throat has been inspected, the condition of the nasal and naso-pharyngeal cavities should also be ascertained.

Before making an examination, inquiries are necessary to elucidate facts concerning the patient's condition, and in making notes of the case, regard should be had to orderliness. The completeness of the story is thus ensured, and in the study of the case details are more readily grasped. The **name** is ascertained for purposes of identity, and for future reference ; the **age** is noted for similar reasons, and also because it is occasionally of importance as an aid to differentiation in doubtful conditions ; and **occupation** is inquired into. A knowledge of the occupation is sometimes

of the first importance, giving in many cases an indication of the probable cause, and it may furnish a clue to the exciting cause, of the diseased condition in cases where the diagnosis is otherwise doubtful. For example, the case of workmen who are exposed daily to the fumes of irritating gases, or whose occupation involves the continuous breathing of air laden with solid particles, coal and metal dust, etc., may be mentioned.

The **patient's account** of his symptoms is then obtained, in the order of their appearance, and the supposed cause, if possible, inquired into. In thus taking the patient's history attention must be carefully confined to facts, as the opinions expressed by patients are frequently supposititious, and often erroneous. When, for purposes of eliciting exact information, a question is put, it should be simple, clear, and readily comprehended, so that an intelligible reply may be given. Special note should be made of symptoms referable to any particular locality, and, as in general "case-taking," family history should be inquired into, with more or less detail according to the condition under investigation.

Means of Examination. Having obtained the necessary information regarding the patient and the nature of the complaint, the examination of the parts should then be proceeded with. Though the sense of sight is of the first importance, considerable assistance is rendered in many instances by other three of the special senses, when educated for this purpose, and these should be habitually employed.

By the sense of **smell**, changes in the odour of the breath are detected. For example, there is the characteristic odour arising from the presence of carious teeth; the very disagreeable odour of ozæna; the mercurial breath, and the smell of alcohol. This latter is both common and important, and its detection may be useful in directing attention to the cause of faucial and pharyngeal congestions which otherwise might be puzzling.

By the sense of **hearing**, changes in speech, in the voice, and in the breath-sounds are detected. Enlargement of the tonsils, cleft palate, and perforation of the palate, occurring as a congenital malformation or as the result of disease; paralysis of the palate, a not uncommon sequela of diphtheria, and paralysis of the tongue as met with in glosso-labio-laryngeal paralysis, each produces a characteristic change in the speech. The voice may be modified in a variety of ways, or even abolished by many and widely-differing laryngeal conditions. The breath-sounds, again, may have more or less of a snoring character when obstruction exists in the faucial, pharyngeal, or nasal cavities; and where the obstruction is laryngeal the shrill note produced by the strained breathing at once arrests attention.

Touch is employed in the detection of fluctuation, and of tenderness, and in determining the degree of resistance of a part, as in differentiating between a simple and a malignant ulcer. Touch in pre-laryngoscopic times was successfully employed in diagnosing several laryngeal conditions, examples of which are recorded by Professor Gairdner in his *Clinical Medicine* (Edinburgh, 1862); and at present, touch is of the first importance in the examination of the pharyngo-nasal space and the posterior nares.

Examination by the sense of **sight** is next proceeded with, and although in many cases little time need be spent in viewing many of the parts about to be enumerated, it is wise in all cases at least to look at them, in order that no point which might assist in arriving at a correct diagnosis may be overlooked.

EXAMINATION OF THE MOUTH.

First the **lips** are examined. These may be pale, as in general anæmia, arising from many causes, or they may be livid or cyanotic from interference with respiration, or from some cardiac condition. Again, where the patient's

temperature is febrile, the lips may be dry and possibly coated with sordes, which consist of an accumulation of mucus and saliva with particles of food, dried, crusted, and firmly adherent to the parched mucous membrane. In children a naevus may be met with on either lip, causing it to be prominent and discoloured at the part affected. A vesicular eruption—*herpes febrilis* or *labialis*—may occasionally be observed. It is always symptomatic of some internal disorder, and is met with in its most characteristic form as a symptom of acute lobar pneumonia. In many persons herpes of the lips or face appears during the currency of an acute catarrh, or it may follow a rigor, especially when associated with irritation of a mucous tract. The vesicles, usually few in number, are of large size; they remain separate, their clear contents rapidly become turbid, and they dry up into scabs, which are soon thrown off, and all trace of them is lost within a short time. Around the lips, and especially in the skin near the angles of the mouth, white lines radiating from each angle may occasionally be seen, and when found the question of inherited syphilis, as the cause, should be entertained. The mucous membrane at the junction of the upper and lower lips may be hacked or fissured as a result of inherited or acquired syphilis, and on the inner or buccal surface mucous patches are frequently to be found in those suffering from the earlier stages of the same disease. Somewhat similar patches are said to result from irritation of the surface by dirt and moist secretions, when of course their existence is unaccompanied by other evidences of syphilis. In hospital practice epithelioma of the lower lip is not uncommon, and the possibility of a primary syphilitic lesion—a hard chancre—on either lip should be borne in mind.

The general contour of the lips may be altered, and their movements interfered with, in certain paralytic conditions. The most common illustration is that met with in facial

paralysis, and in cases of hemiplegia implicating the facial muscles, where the angle of the mouth is lowered on the paralysed side. The resulting deformity becomes more apparent when the patient smiles. In myxoedema, again,

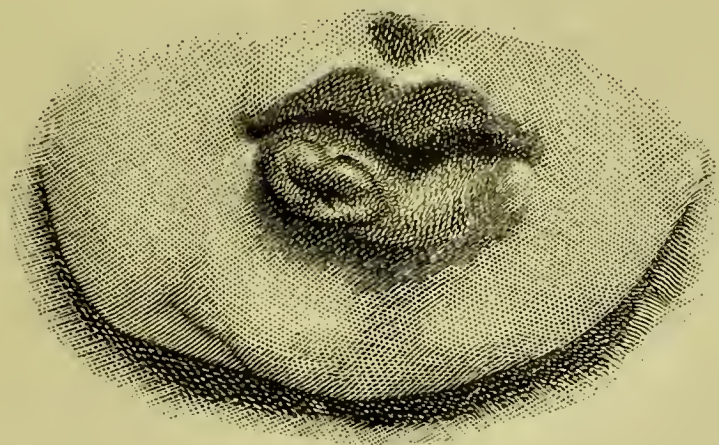


FIG. 1.—Hard chancre of five weeks' duration on the lip of a girl aged 13. (From a photograph by Dr. Kennedy.)

the lips are thick and prominent, and the movements clumsy and difficult. Contraction of the lips may be met with as a result of burns, syphilitic ulceration, or cancrum oris, and in such cases the presence of cicatrices bears evidence to the destructive nature of the lesion.

Next in order the **teeth** should be inspected. Mr. Jonathan Hutchinson has drawn attention to a malformation of the permanent teeth associated with hereditary syphilis. In a typical case the upper central incisors are stunted both in length and breadth, peg-shaped, and each bears a crescentic notch at its free margin, due to want of development of the middle denticle. The lower incisors



FIG. 2.—Upper central incisors of the permanent set (after Hutchinson).

in such patients have frequently a worm-eaten or honey-combed appearance, a condition described by dentists as

“rocky” enamel, which, however, is not distinctive of the syphilitic taint, as a similar appearance may be brought about by the occurrence of any severe illness during dentition. It is also found in those the subjects of rachitis. Teeth more or less destroyed by caries not infrequently produce irritation and inflammation of the parts which come in contact with them, and this in turn may spread and involve a larger area. A badly fitting denture may occasionally be found to be the source of a patient’s discomfort.

An examination of the **gums** is equally important. Like the lips, they may be pale or livid, and from similar causes. When the teeth are in an unhealthy condition the outline of the gums is often irregular, and the surface spongy and at parts eroded. Sponginess of the gums, along with submucous hæmorrhages, are associated with both purpura and scurvy; and a somewhat similar condition may be found, along with marked fœtor of the breath, where the administration of mercury has been ‘pushed.’ The blue line along the edge of the gum indicative of lead poisoning, and the red line associated with delicacy of constitution—though not necessarily phthisical, as held by some—should not be overlooked. The gum surrounding a carious tooth may be inflamed, swollen, and tender, the inflammation resulting in a superficial alveolar abscess or gum-boil; or the inflammatory process may be more deeply seated as the result of acute dental periostitis, when pus forms around the fang of the tooth. In this maxillary, or deep alveolar abscess, the gum is greatly swollen, the cheek is also red, swollen, and tender, and the lower jaw becomes fixed by inflammatory deposit. Pus may be seen to well up along the side of the tooth, but when it cannot find a way of escape in this direction it may, by burrowing, separate up the periosteum from the bone and lead to necrosis of a portion of the jaw. This in turn may lead to the formation of a pus-discharging sinus.

During the examination of the gums new growths may be discovered. Of these epulis, which is a small, rounded, or irregularly shaped growth covered with mucous membrane, is perhaps the most interesting. It may spring from the alveolar process and periosteum of either jaw, though it is most commonly met in connection with the lower jaw, and as it increases in size it displaces the teeth. In some cases it appears to be of the nature of a simple fibrous tumour, though usually its structure is that of a round-celled sarcoma.

The mucous membrane lining the **cheeks** is next examined. It may be found to be injected generally, as during the course of a common cold, or the area of injection may be circumscribed when it results from some local irritant, as a jagged tooth. The position of the opening of Stenson's duct, the excretory duct of the parotid gland, should be noted. It is usually readily seen by separating the cheek from the jaw, and it will be found to perforate the lining membrane of the cheek obliquely opposite the second molar tooth of the upper jaw. Should any difficulty be experienced in locating it, the lining membrane of the cheek should be dried, then the tongue touched with an acid—lemon or vinegar—and at once a bead of secretion will appear at the mouth of the duct.

Mucous patches may be met with on any part of the buccal mucous membrane, though their site is usually determined by some local irritant, and they are frequently found at a part which lies in contact with a foul or broken tooth. These patches are similar in appearance to mucous tubercles found elsewhere—serpiginous in outline, slightly elevated, with a flat, dirty-white surface. They are altogether different in appearance, as in nature, from aphthous ulcers, which are often met with in poorly-fed or carelessly-fed children, and in adults far spent by some exhausting disease.

Thrush (Fr. *muguet*) appears as small, whitish, slightly-

elevated spots, often present in considerable numbers, and resembling particles of curd, for which they are apt to be mistaken. If the white patch is removed, the surface beneath is usually found to be excoriated. The white coating is composed of cast-off epithelial cells, held together by the threads of a fungus—the *oidium albicans*—which latter, if treated with *liquor potassæ*, is readily demonstrated under the microscope. The reaction of the surface on which this growth flourishes is acid.

Cancrum oris, which is usually an inflammatory affection of the cheek, though it sometimes affects the lips, the gums, and even the jaws, is met with comparatively rarely. It occurs as a rule after measles, chicken-pox, and scarlet fever, in weakly, badly cared-for children, whose surroundings are unhealthy, and it rapidly runs on to ulceration and gangrene. If recovery has taken place, the site of the ulcer will be marked by an extensive cicatrix. In a large proportion of such cases firm fibrous ankylosis of the jaw results, a condition which seriously interferes with alimentation.

A doctor's visit is considered by many to be incomplete unless the **tongue** is inspected. It must not, however, be simply looked at as a matter of routine, but examined intelligently. If the patient be asked to protrude the tongue it is usually fully exposed, and occupies the middle line. Occasionally, and especially in children, the tip alone is extruded in cases where the frænum linguæ is short and firm, while in adults this difficulty may be due to ulceration of the frænum or to enlargement of the tongue from many causes. Again, in hemiplegia the tongue is pushed *towards* the paralysed side when protruded; in chorea it is protruded spasmodically, and continues to move in a jerky fashion while attention is being directed to it; and in chronic alcoholism there is a trembling of the tongue when protruded, resembling the tremor which occurs in the late stage of typhus and enteric fevers.

The tongue may be large, pale, and flabby, with indentations on the edges corresponding to the teeth, as in chronic dyspepsia; it may be red and raw-looking, as in the earlier stages of some fevers; and it may show the red injected papillæ appearing through the white fur, and producing what is known as the "strawberry" tongue of scarlet fever. The coating on the tongue known as "fur" consists for the most part of epithelial cells, and whatever tends to irritate or inflame the tongue, by increasing the blood supply to part of the tongue or to the whole organ, causes the epithelium to be formed more rapidly than it is shed, and in this way adds to the fur. Gastric disturbance is the most common cause of a generally furred tongue. Fur limited to one side or to some particular part of the tongue may be due to direct irritation, as from a sharp tooth; to inflammation of a neighbouring part, such as acute inflammation of the tonsil; or it may be, as pointed out by Mr. Hilton in his lectures on *Rest and Pain*, produced by a reflex mechanism through the second and third divisions of the fifth nerve. The irritation in this case is caused by a carious tooth, and the fur is limited to the portion of the tongue supplied by the fifth nerve, namely the anterior two-thirds. Mr. Hutchinson, however, in the *London Hospital Reports*, vol. iii., takes exception to this, and says that one-sided fur of the tongue is caused simply by the circumstance that its subject is accustomed from habit, from loss of teeth or the like, to eat on only one side of the mouth, the tongue, on the other side, becoming furred as a consequence.

The circumvallate papillæ, which are placed at the junction of the anterior two-thirds with the posterior third of the tongue, are eight to ten in number, and are arranged in the form of a **V** with the point directed backwards. They vary greatly in size and appearance in different individuals, and occasionally a patient, seeing them by chance for the first time, as prominent red bodies apparently

growing from the surface of the tongue, mistakes them for a diseased condition and is alarmed. These, and the veins at the base of the tongue, which occasionally become varicose—the so-called “throat-piles” of Mr. Lennox Browne—are best examined by the help of a laryngeal mirror.

Then there may be spots of thrush similiar to those found on the lining membrane of the cheek, and often occurring here in large numbers. Fissures on the dorsum of the tongue may be observed as a syphilitic lesion, and mucous patches may be met with on any part of the tongue, but most frequently near the tip or along either edge, their site being frequently determined by some irritant, such as a tobacco pipe or a ragged tooth. Over the surface of the tongue there may be “bald patches” of syphilitic origin, caused by destruction of the epithelium, and side by side with these there may be warts and condylomata from hypertrophy of the papillæ. These usually occur over the dorsum in front of the circumvallate papillæ. The surface of the tongue, again, may be scarred, or the greater part of the muscular tissue may be replaced by cicatricial tissue, the result of the breaking down of numerous gummata, in which the healing of the resulting ulcers had been followed by deep and extensive cicatrization. In such a case, the whole tongue becomes hard and almost devoid of sensation. Epithelioma, which in its early stage is apt to be mistaken for a syphilitic lesion, may occur on any part of the tongue, and the hard-edged ulcer may be small and limited to the tongue, or it may be extensive and spread to, and involve, neighbouring structures.

The tongue, again, may be greatly increased in size. In some forms of gastric disturbance the tongue becomes inflamed and swollen. Again the tongue as a whole may be enlarged by a uniform syphilitic infiltration, a manifestation of tertiary syphilis in which there is little complaint of pain, and the organ on palpation is felt to be hard and firm.

In acute inflammation (glossitis) the tongue is not only greatly swollen but is tender to the touch, and should this go on to suppuration, fluctuation may be detected. In this latter condition the size of the tongue interferes with both feeding and breathing, and the patient usually has the mouth widely opened owing to the obstruction to respiration, while in some cases the tongue, on account of its size, projects from the open mouth. A somewhat similar appearance may be produced by swellings beneath the tongue, the commonest of which is ranula. This is a cystic tumour in the sublingual region, consisting of a collection of glairy mucus pent up in one of the follicular glands of the floor of the mouth. It has seldom any direct connection with Wharton's duct or the salivary gland. Wharton's duct, however, may be blocked as a result of inflammation, or the impaction of some concretion or calculus, and the submaxillary gland as a consequence may attain a large size, and even go on to suppuration. As a part of the same condition the sublingual gland of the same side may also become enlarged, when the tongue will be pushed upwards and towards the unaffected side.

The *frænum linguæ* may be unduly short, a condition which hinders the free movements of the tongue, and in an infant it may interfere with its powers of suction. Ulcerations of the frænum may be traumatic, as occasionally occurs during the course of whooping cough, when this structure is inflamed or even torn by sharp contact with the lower incisor teeth during violent spasms of coughing, or the ulcer may be aphthous, syphilitic, or tubercular in nature.

While making an examination of the tongue it will be found necessary in certain cases to test the patient's sense of **taste**, and in some the **tactile sense** as well. In testing the former it is necessary to employ substances other than odoriferous materials, which are detected more by the sense of smell than by taste. The nerves which serve as the

special nerves of taste are the terminals of the *glossopharyngeal* and *lingual* nerves, distributed over the mucous membrane of the tongue and palate. In addition, the *chorda tympani* is held by some to be the nerve of taste at the anterior part of the tongue. If the intention is to examine the tongue alone, this organ should be protruded while making the test. The substances employed must be soluble; picric acid as a bitter and sugar as a sweet substance are convenient as tests; and it is well to remember that, in their application, the effect is increased by friction. Taste is said to exist only for acid, bitter, sweet, and saline substances. The sensation may also be excited by the passage of a constant current of electricity through the tongue. If the positive pole or anode is placed on the organ, and the negative on an indifferent part of the body, an alkaline taste is produced, and if the negative pole or cathode be similarly applied, an acid taste results.

The tactile sense is best tested according to Weber's method by means of a pair of compasses.

EXAMINATION OF THE FAUCES, PHARYNX AND LARYNX.

The interior of the mouth, the palate, the fauces, the pharynx, and the larynx may be examined by *direct illumination* and direct inspection, or by means of mirrors and *reflected light*.

Direct illumination and inspection of the buccal cavity and its contents may be accomplished by placing the patient with his face directed towards a well-lit window, when, with the mouth widely opened and the tongue pressed towards the floor of the mouth, the palate, the fauces and the pharynx may be seen in a more or less satisfactory fashion. But in order to examine those parts carefully and to determine their condition accurately, as well as to be able to see the posterior surfaces of the fauces, the upper

part of the pharynx, the naso-pharynx and the interior of the larynx, a brighter light than is usually obtainable in the consulting room from the sun, is required, along with special apparatus.

The laryngoscope is the name given to the arrangement of mirrors used in the examination of the larynx, and laryngoscopy is the art of examining the interior of the larynx.

To examine the larynx by this method, three things are essential.

1. A bright light.
2. A forehead mirror.
3. A laryngeal mirror.

The **forehead mirror** and the **laryngeal mirror** together form the laryngoscope, which is an instrument of such recent introduction, that the jubilee of its invention and the hundredth birthday of its inventor, Signor Manuel Garcia, a famous teacher of singing in London, was celebrated in London in April 1905. By it he had studied the movements of his own vocal cords. Its employment in medical practice dates from 1857, when TÜRCK of Vienna and CZERMAK of Pesth urged its use upon the profession, as being a means whereby intra-laryngeal affections could be diagnosed with accuracy, and treated directly.

1. **The light.** For purposes of illumination, the flat flame of an ordinary gas jet, or of an oil lamp, will be found very serviceable, and it is well to accustom one's self to their use, as in general practice one may at any time be under the necessity of making an examination by the help of one or other. When called upon to examine a patient confined to bed an oil or candle lamp may be employed, or some form of electric light may be resorted to. This latter may be used in the form of a small lamp which, fitted to a laryngeal mirror (to be described) is placed within the mouth; or the lamp attached to a portable battery or one lit from the household supply may be used as the source from which

light is reflected by the forehead mirror into the patient's mouth; or the lamp (photophore) may be fitted to a forehead band or spectacle frame, and so arranged that the rays are directed from the forehead of the examiner into the patient's opened mouth. The small low voltage lamp may be supplied by current from storage cells or from primary batteries of various sorts, while the supply for the larger lamp may be taken direct from the main. For the consulting-room probably the most useful, reliable, and most easily managed light is ordinary gas, used with a bracket which is readily raised or lowered, and which may be fixed at any desired level, after the style of Morell Mackenzie's rack-movement bracket. With this it is well to have an Argand burner (circular flame), or a Welsbach incandescent hood, and to have the light either partially surrounded by a parabolic reflector or, and perhaps better, enclosed within a concentrator—a metal funnel furnished with a bull's-eye lens. The advantage of this latter method is that a bright light is obtained, which may be concentrated on any particular point while the rest of the room is kept in comparative darkness. The Welsbach hood, which is now much more durable than when first introduced, gives a brilliant white light. The oxyhydrogen lime light is employed by some, coal gas being used in place of hydrogen, and it is said to be much less troublesome since the introduction of the zinconium disc as a substitute for the friable lime.

2. The **forehead mirror** is a concave circular mirror, encased in metal about three inches in diameter, having a focal distance of from ten to fourteen inches and perforated in the centre. This perforation, which may be either round or oval in shape, the latter is to be preferred, should be through both the glass and its case.

The mirror is attached to a forehead band or to a spectacle frame by means of a ball and socket joint. This joint and

its binding screw should be so arranged as to make it in reality a universal joint, and so permit of the free movement of the mirror in every direction.

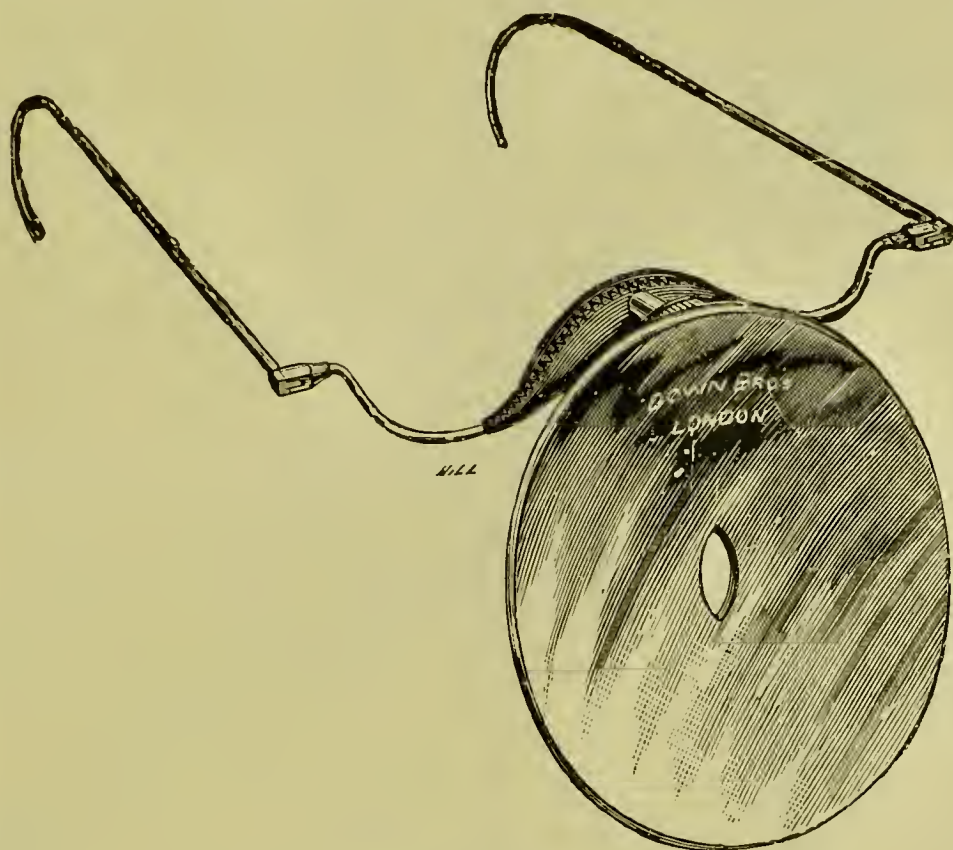


FIG. 3.—Forehead mirror on spectacle frame.

3. The **laryngeal mirror** consists of a small mirror made of glass backed with amalgam and set in a metal case. The circular form is that most generally useful, though under certain circumstances one of an oval shape is more readily applied, and some surgeons prefer a lozenge-shaped reflecting surface. It is well to have at least three circular mirrors, varying in diameter from half an inch to one inch and a quarter, each of which is fixed to a metallic stem of about four inches in length, and in such a way that the mirror and stem meet at a angle of 120° . The stem should be pliable to admit of the ready alteration of this angle as desired, and the stem is fixed to a wood or metal handle by means of a screw or otherwise.

THE PALATE, FAUCES, AND PHARYNX.

Having considered the means employed for the illumination of the cavity of the mouth and of the parts beyond,

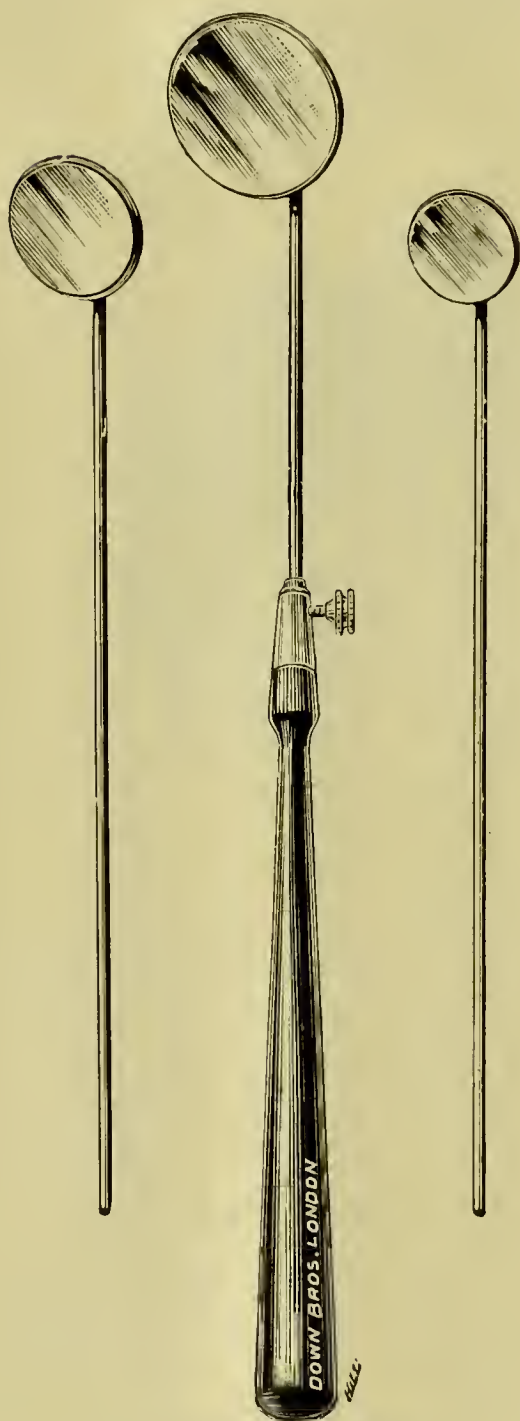


FIG. 4.—Laryngeal mirrors.

we next set about examining the **fauces and pharynx**. For this purpose the patient is seated on a chair, in the upright position, with the knees together: and the surgeon sits facing the patient. The gas bracket, or other source of light, should be so arranged that the gas flame or the electric lamp is close to, and on a level with, the patient's left ear. The forehead mirror, fixed to the surgeon's head by means of the band or spectacle frame, is worn over the right eye, and in such a position that the examiner can see through the perforation with his right eye and past the edge of the mirror with his left eye. When the mirror is in this position the examiner's eyes are both shaded from the glare of the bright light directed from the near neighbourhood of the patient's left ear. The mirror fixed to his head is then so adjusted that the light from

the lamp is reflected on to the patient's lips; and before proceeding further, care should be taken that the brightest

illumination possible under the circumstances is obtained, without unnecessary struggles on the part of the surgeon to attain a comfortable position. To help further in the examination of these parts a **tongue depressor** is necessary. One having a narrow blade like FRÄNKEL'S is most useful for this purpose and is least resented by patients. It consists of a long narrow blade fenestrated at the extremity, curved to adapt itself to the curve of the tongue, and roughened on the under surface around the opening to grasp the tongue more efficiently. The blade is fixed to a

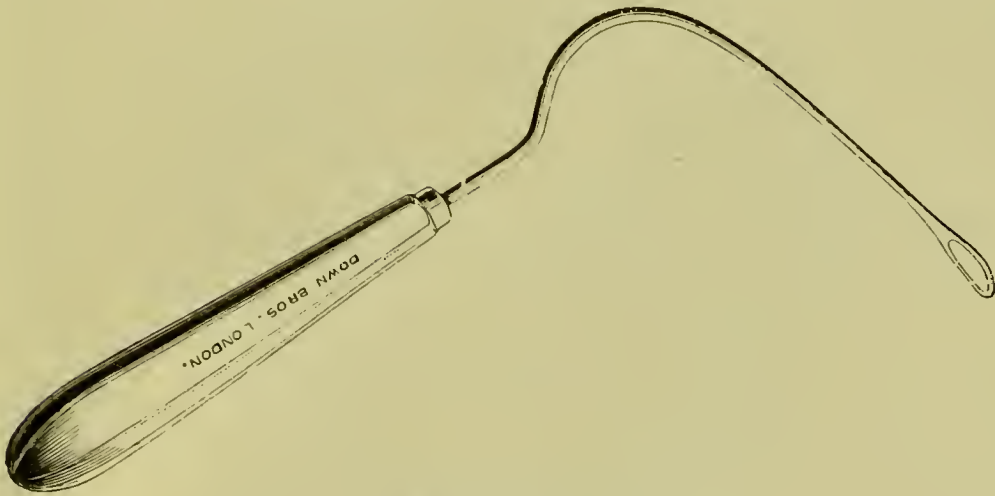


FIG. 5.—Fränkel's tongue depressor.

long metal handle, by which it can be readily held in position without the surgeon's hand encroaching on the line of vision. This narrow depressor is also useful in the examination of the lips, edges of the tongue, the gums, and the lining membrane of the cheeks; and by getting the uvula into the fenestrated portion, the soft palate can be elevated, and a considerable part of the pharyngeal wall exposed.

For the examination of those adults where the tongue is thick and fleshy, or large and flabby, and also for operation purposes, a tongue depressor having a broader and a stronger blade is necessary.

With the patient seated as described and the light

reflected from the forehead mirror falling on the lips, he is requested to breathe quietly through the widely-opened mouth. By way of response he very frequently breathes through the nose. While breathing with the mouth open, if the tongue lies on the floor of the mouth as it does in those who have had special training in the use of the voice, the fauces are freely exposed. In many, however, the dorsum of the tongue rises up and hides the parts beyond the point where the tongue and palate meet, and it becomes necessary to use the tongue depressor. In applying it, it should be placed well over the tongue, with the fenestration over the central circumvallate papilla, and pressed gently but firmly downwards towards the floor of the mouth. If this is done gently, retching is not excited, except in those cases where the sensitiveness of the reflexes is extreme. The parts brought into view should then be carefully and methodically examined much in the following order.

(1) The hard palate and (2) the soft palate, terminating at the centre posteriorly in (3) the uvula. Then stretching from the base of the tongue at either side is (4) the right and (5) the left anterior faucial pillar, behind which are (6 and 7) the right and left posterior faucial pillars also blending with the base of the uvula; and lying between the anterior and posterior pillars are (8 and 9) the tonsils, one on each side. Immediately above each tonsil there is (10 and 11) a somewhat triangular space, described as the supra-tonsillar fossa, which should be examined. As a background (12) a portion of the posterior wall of the pharynx is seen. Where the parts are normal those various structures should be seen in every case. The upper border of the epiglottis may, in addition, be occasionally seen, and that more frequently in children than in adults. In other cases the epiglottis may be brought into view if the tongue be drawn well forward, or if the larynx be pushed upwards

from outside, and it may also be seen during the act of retching.

If the parts are examined, as they should be, in the order given, there will be little risk of any abnormality, or evidence of disease which may be present being overlooked.

The Palate.—In an examination of the **hard palate** the patient's head requires to be thrown well backwards. It

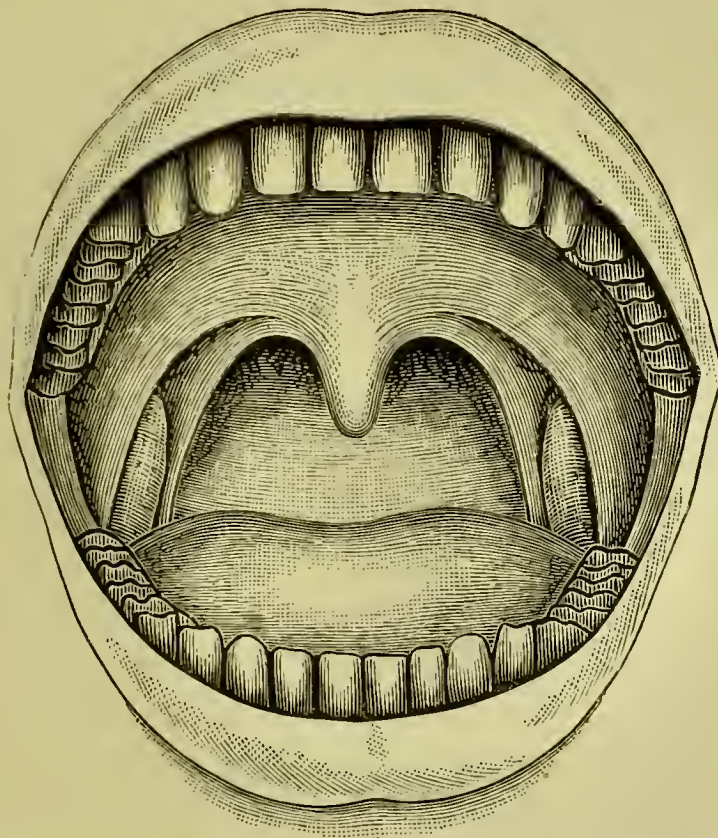


FIG. 6.—Buccal cavity with view of palate, fauces, and pharynx (after Lennox Browne).

may be observed that the form of the palate varies considerably. The roof may be unusually high, and the lateral walls unduly close to each other. This narrow, high palate, which is associated with a very narrow alveolar arch, was long looked upon as a syphilitic lesion. But while it may be found in the subjects of congenital syphilis—and I have seen it in a very marked degree in imbecile children, the offspring of syphilitic parents—it is now considered to be the direct result of nasal obstruction in early life, a

condition which interferes with the development of the superior maxillæ. On the other hand, the surface of the palate may be unduly flat, chiefly from absorption of the alveolus following the loss of the teeth, a condition which often gives a dentist considerable trouble in the application of a denture.

Paralysis of the Palate may be met with as a sequela of diphtheria, and as one of the earliest of the post-diphtheritic pareses. It may also occur as a result of disease of, or injury to, the temporal bone. More rarely cases occur in which it is present as one of the features of glosso-labio-laryngeal paralysis. When paralysed, the whole palate appears relaxed, reflex movement is abolished, and it hangs loosely and remains stationary during deep inspiration, during deglutition, and while the patient speaks. As a consequence, food, especially in fluid form, tends to return by the nose during the act of swallowing, from non-closure of the naso-pharyngeal opening, and speech has a characteristic, nasal sound.

The palate may be cleft, perforated, or absent from congenital malformation, or it may be partially or wholly destroyed as the result of accident or disease. In the course of development the palatine processes approach each other, and, with the descending nasal septum, unite in the middle line. When this fusion has not occurred, an opening or cleft remains, and its extent depends on the period at which development was arrested. It may simply affect the uvula, when we find that appendage bifid; or it may involve the soft palate, the cleft stopping short at the edge of the hard palate; or in other cases the fissure may extend throughout the length of the palate, soft and hard. These latter cases, along with those where the anterior portion of the hard palate alone is cleft, are usually associated with hare-lip, single or double.

Again, the palate may be perforated, usually as a result

of the destructive action of syphilitic inflammation. The gummata which form here frequently appear suddenly, and progress rapidly, and the destructive process is deep. Sometimes the resulting perforation is in the form of a small circular opening through the hard palate into the nose. This affects the speech of the patient by giving it a nasal tone, and discomfort is apt to accompany the swallowing of fluids, a portion of which frequently passes through the perforation into the nose. The necrotic action, however, may be much more extensive, causing not only the disappearance of the palate, both hard and soft, but affecting the nasal bones as well. Such a case in a woman, aged 30, was recently under my observation at the Western Infirmary. Within three months of the time she first felt pain in the roof of her mouth, the buccal and nasal cavities had become one common cavity, owing to the destruction of the palate, vomer, and cartilaginous septum. Paget in his *Lectures on Surgical Pathology* refers to a case where destruction of the palate resulted from absorption consequent on pressure. The woman had an aperture in the hard palate, and was accustomed to plug it by means of a cork, in order to remedy the discomfort resulting from the perforation. The constant pressure of so rough an obturator produced absorption of the edges of the opening, making it constantly larger, and requiring that the cork should be often wound round with tape to fit the widening gap. The remedy thus went on increasing the deformity, till of all the palatine portions of the upper maxillary and palate bones, nothing but their margin and outer shell remained, the rest having all become absorbed.

Where the parts are intact, the colour of the surface of the palate should be observed. This may, like the lips, be pale as in general anæmia, and the undue pallor may be brought into greater prominence by a localised hyperæmia, such as is frequently met with at the free border of the

anterior pillars in anæmic patients. General hyperæmia may vary in degree, and may be associated with a variety of conditions. It may be the result of local irritation, as from the use of highly spiced foods, or the excessive use of tobacco or alcohol. When the latter has been used to the extent of producing gastric disturbance, the hyperæmia of the palate and fauces is sometimes extreme.

In simple catarrh, due to a common cold, a general reddening, involving the surface of the hard and soft palate, the fauces, the tonsils, and pharynx, will be observed, the depth of colour corresponding, usually, with the acuteness of the attack. Similarly in measles, especially where catarrhal symptoms predominate, injection of the fauces is frequently met with, and the hyperæmia is of wide distribution. The coryza, and the mottled skin eruption will point to the cause. In scarlet fever a somewhat similar condition is almost invariably met with, and in varying degrees, at an early stage of the disease. It is associated with a higher temperature than is present in simple catarrh, and the accompanying eruption over the body will at an early stage remove doubt as to its nature. Associated with those conditions, especially where the inflammatory process is severe, a swollen and œdematous state of the uvula is frequently found, causing trouble in breathing, and giving rise to a frequent irritating cough, and in some cases to sickness and retching. A general injection of the palate and fauces, which is very similar to that met with in scarlet fever, occurs as one of the earliest of the constitutional manifestations of acquired syphilis. This hyperæmia, however, in the course of a few days becomes limited to the soft palate, or it may be to the anterior pillars and tonsils, when the line of demarcation between diseased and healthy tissue becomes sharp, and the affected areas on the two sides are symmetrical. White spots of thrush may be found on the palate and fauces, similar to those met with on the tongue

and lining membrane of the cheeks, and under similar conditions. Herpes may also affect those parts, and when it occurs on the soft palate the vesicles may rapidly become purulent. When these rupture, small superficial circular ulcers result.

The **uvula** may be considerably elongated, pale and flabby from a relaxed state of its mucous membrane. When this is the case it tapers towards the point, which may be found resting on the dorsum of the tongue. It may, again, be enlarged and bulbous from hypertrophy; its size may be considerably increased from œdema, or it may be bifid as already described. In some cases the uvula may be absent, occasionally as a congenital deformity, but more usually as the result of ulceration. (See Figs. 16 to 22.) The destructive process which may lead to its loss may occasionally be of a lupoid or chronic tuberculous nature, or it may be, as it is in the majority of cases, due to syphilis. As a result of this same disease, where the ulceration has been extensive rather than deep, not only may the uvula be destroyed, but the edge of the soft palate may have been encroached upon, causing it to have an irregular outline. Occasionally a case may be seen where the palate and the pharynx have become united, the result of cicatrisation following extensive ulceration of the fauces and pharynx.

When examining the **fauces** it is well to observe the relative position of the pillars and tonsils. When the parts are in a normal condition, the tonsil on each side shows out behind the anterior pillar towards the middle line, and the free border of each posterior pillar in its turn comes nearer to the middle line than the tonsil.

The Tonsils.—The **tonsil** in different people varies greatly, both in size and shape, and the two in any given case may be totally unlike each other. The size and appearance of the tonsil may be greatly altered by inflammation. It may

appear as a large red globular swelling when the substance of the gland is inflamed, an affection spoken of as parenchymatous tonsillitis or quinsy. When both tonsils are so affected they may meet in the middle line. The tissues around the inflamed tonsil, and chiefly the surrounding loose areolar tissue, may also become inflamed (peritonsillitis) and go on to suppuration, with or without the formation of pus in the tonsil itself. Instead of the inflammation affecting the tonsil as a whole, the crypts or follicles may alone be implicated, when the condition is termed follicular tonsillitis. The mouths of the follicles are filled with a white secretion, and on account of the surface of the tonsil being thus studded with white spots, it is known in some parts of the country as "spotted sore throat." It is usually of a simple character, and has no connection with diphtheria, with which, however, it is frequently confounded. In both forms of tonsillitis the patient speaks thickly, and has difficulty in swallowing and in breathing. These symptoms are accompanied by headache, general malaise, and the constitutional disturbance is occasionally severe; with high temperature, rapid pulse, and foul tongue. Mucous patches are frequently met with on the tonsils. As the hyperæmia, described as an early manifestation of secondary syphilis, is disappearing, portions of the tonsil become white and glistening, presenting an appearance very similar to the mark produced by the passage of a snail over a stone or blade of grass: thus those glistening marks have been called "snail-tracks." In the course of a few days these become white and opaque from necrosis of the affected epithelium, and the resulting lesion is a "mucous plaque" or "mucous patch." In unhealthy patients the surface so affected may rapidly become eroded, but in those who are otherwise in good health the patches tend to disappear spontaneously.

The tonsil may be the seat of a deep ulcer, syphilitic,

epitheliomatous or tubercular in nature. In its earlier stages an epithelioma may simulate a syphilitic ulcer, for which it may be mistaken. Primary epithelioma of the tonsil, though denied by some writers, does unquestionably occur. Personally, I have seen at least three cases, one of which was exhibited by me before the Glasgow Medico-Chirurgical Society, and the notes published in the *British Medical Journal*, November, 1890. Usually, however, when epithelioma attacks the tonsil it is due to the spread of the disease from the tongue or other neighbouring structure. The ulcer is similar to that met with on the tongue and, like it, occurs after middle life. Its edges are irregular, slightly elevated, and hard on palpation, and the surrounding tissue of the tonsil is infiltrated. The surface of the ulcer is usually coated with foul smelling discharge, and when this is cleared away the surface exposed is raw and angry-looking, and bleeds on slight provocation. The spreading of the ulcer is frequently accompanied by severe hæmorrhage. Pain, most frequently complained of in the ear, or as shooting to the ear on the affected side, is also associated with the presence of this ulcer in most cases. The pain is out of all proportion to the size of the ulcer, standing thus in marked contrast to the majority of cases of syphilitic ulceration, where little or no pain is complained of, even where there may be great destruction of tissue. The lymphatic glands on the affected side become enlarged, and deglutition is accompanied by severe pain.

Sarcoma of the tonsil is occasionally met with. Its growth is rapid, and it increases in all directions, attaining in some cases enormous proportions. On account of its size it interferes with deglutition and with respiration, and from the latter cause, sleep is always of a broken character. On palpation the sensation experienced closely resembles fluctuation, from the high elasticity of the tumour, but

should it be explored with a needle blood alone escapes. The patient quickly loses flesh and strength, and his pulse becomes rapid and weak.

During the course of scarlet fever, as has been said, the fauces invariably become affected, and when the patient is the subject of enlarged tonsils, these become specially implicated. They increase in size, and the surface is deeply injected; they may be coated with tenacious mucus; or they may be covered with white patches, which, it is important to note, can readily be brushed away. Under certain circumstances, such as where the patient is in feeble health, the surroundings insanitary, the local inflammation very acute, etc., superficial ulceration may occur, and in some cases actual sloughing of portions of the mucous membrane, or even of the substance of the tonsil, may be met with as a complication. The white patches and the grey sloughs on the surface of the tonsil are sometimes mistaken for diphtheria.

The membrane which is met with as a characteristic part of diphtheria appears, in its early stage, as a viscid, yellowish secretion, collected for the most part in the depressions of one or both tonsils. The superficial layers of the mucous membrane become infiltrated at certain points, and these parts become elevated above the level of the surrounding surfaces. These patches rapidly assume a greyish-white appearance, they tend to spread, sometimes rapidly, and to coalesce with similar adjacent patches. In this way the whole surface of the tonsil may be covered with false membrane, as it is termed, which soon becomes tough and leathery. It may in like manner spread over the fauces, and pharynx, and it may extend to the nares, the larynx, the trachea, and the bronchial tubes.

As already stated, those patches of exudation will be seen on examination to involve the mucous membrane, so that if they are stripped off, the surface beneath will be

found denuded of its epithelium, and bleeding at various points. The white spots of secretion found in follicular tonsillitis, on the other hand, which simply lie *on* the surface, can be readily brushed away, leaving the underlying mucous membrane intact.

The size of the tonsil may be increased by the presence of a foreign body, which may be composed of the normal secretion, with a deposit of lime salts, retained within the lacunæ of the gland. Of foreign bodies introduced from without, those most commonly met with are fish bones. These not infrequently enter one or other of the lacunæ, especially when the patient has enlarged tonsils. When a fish bone is thus retained and moistened with saliva it becomes almost transparent, but with a good light it is readily detected, and is usually easily removed.

The Pharynx.—The condition of the **pharynx** should next be investigated. That part which is seen through the open mouth is termed the **buccal pharynx**, but it must be remembered that the pharynx proper extends from the basilar process of the occipital bone above, to the interval between the fourth and fifth cervical vertebræ below, and that the posterior wall throughout that length is uninterrupted, and is continuous, below, with the œsophagus and larynx. Anteriorly its wall is interrupted by the nasal and oral cavities. The posterior wall of the pharynx seen through the mouth may be pale as in anæmia and leucocythæmia, or it may be congested to a varying degree. During the course of a catarrh, in scarlet fever, and in those who have recently been imbibing alcohol freely, the pharynx may be deeply injected, and in most cases the fauces will be similarly affected. The hyperæmia met with, however, may be limited to the posterior wall of the pharynx, when the individual vessels, being deeply injected, are readily traced over the surface, and the various mucous follicles are seen to be hypertrophied. This, from the rough appearance of

the surface, is termed granular pharyngitis. It is frequently associated with rheumatism; it occurs in those who habitually use the voice to excess, and in many who smoke cigarettes immoderately.

Again, the pharyngeal wall may be thinned from atrophy, and the surface dry and glazed, the condition being described as *pharyngitis sicca*; or the surface may be coated with tough muco-purulent secretion; or the discharge may be crusted on its surface. When muco-pus is present it is apt to be mistaken for discharge covering an ulcer, but if it be removed with a swab the mucous membrane beneath is found to be intact. When the discharge has become crusted, the crusts are often dark in colour from impurities conveyed by the inspired air. They are larger and harder the nearer they approach the upper part of the pharynx, where they sometimes stand out like crusts of rupia; and if the pharyngeal surface is carefully examined, from above downward, the hard, dry coating will be seen to become somewhat moist, until slightly below the level of the dorsum of the tongue the surface of the pharynx will be found to be free of discharge. This condition is frequently associated with a chronic inflammatory state of the nares, catarrhal ozæna, and is accompanied by a foul-smelling breath.

Syphilis affects the pharynx, as it does the fauces, both in its secondary and tertiary manifestations; so that mucous patches and superficial erosions, gummata, or deep and extensive ulcers may each be met with here. The latter may be coated and hidden by a thick layer of muco-purulent discharge, very similar to that seen in chronic pharyngitis. It only requires removal with a swab to show the difference between the two conditions. Again, cicatrisation, following an extensive ulcer, may alter the appearance, as it interferes with the function, of the pharynx and the neighbouring structures.

A simple ulcer, the result of injury, may be met with.

Several cases of the kind have come under my care. A small boy, in one case with a tin whistle, in another with a long lead pencil, held between the teeth while running, fell, and the long, sharp body was violently driven inwards, resulting in each case in extensive laceration of the pharyngeal wall.

Sometimes the pharynx is occupied by a swelling, which may be in connection with the pharyngeal wall itself or, springing from some neighbouring part, project into it. Among the former may be mentioned post-pharyngeal abscess, which appears as a smooth, rounded, fluctuating projection. It is a collection of pus between the pharyngeal wall and the vertebræ; is most frequently met with in children; and may be the result of suppuration of the deep cervical or post-pharyngeal lymphatic glands, or of caries of the upper cervical vertebræ.

In children, again, the posterior wall of the pharynx, above the level of the soft palate, is frequently the seat of adenoid vegetations. These growths consist of lymphoid tissue, similar in structure to the tonsils, and when hypertrophied they may attain to such a size as to block completely the pharyngo-nasal cavity. When present in this hypertrophied form, nasal respiration is obstructed, breathing through the mouth becomes a necessity, and hearing in many instances is impaired by occlusion of the pharyngeal opening of the Eustachian tubes.

The resulting physiognomy is characteristic. Not only have the children so affected dull, expressionless faces, but they are usually dull mentally as well, and apparently are unable to fix their attention on any given subject for any length of time. This latter condition was termed *aprosexia* by Guye, who ascribed this mental apathy to interference with the lymphatic circulation of the brain. The lower border of this collection of over-grown gland tissue may readily be seen by the help of a small mirror,

but they are in most cases best examined by passing the forefinger through the mouth and up into the space behind the soft palate. These vegetations in the early stage are soft and friable, like granulation tissue, and when broken down by contact with the finger-nail during an examination they bleed freely. In cases of long standing, fibrous tissue becomes developed, especially towards the base of the individual growths, and they become firm and tough and less in size. They tend to spontaneous atrophy towards puberty.

Of the new growths met with in the naso-pharynx, polypi are the chief. They may be mucous or fibrous in character. The former—mucous polypi—are by far the more common of the two, and they grow from the mucous membrane within the nose, from which they project through the posterior nares into the pharynx. They may appear as small bluish-grey jelly-like swellings projecting from the posterior nares, or they may attain a size almost equal to that of a small Tangerine orange, and, hanging down below the lower border of the soft palate, be visible through the open mouth. Their surface is smooth, and while their colour may vary, it is in the main bluish grey. Fibrous polypi, on the other hand, spring from some part of the wall of the naso-pharynx; they are more red in colour, are hard, firm, and smooth, and are comparatively rare.

When a sarcomatous tumour appears in the naso-pharynx it may have its origin in the sphenoid, in either superior maxilla, or it may spring from the upper cervical vertebræ.

In each of several cases under my care the patient has been in early middle life and in robust health. The tumour grew rapidly until it filled the naso-pharynx very completely, pushing the palate forward and projecting below the free border of the palate. It formed a rounded red swelling, highly elastic on palpation, giving a sensation closely resembling that of fluctuation, for which it is apt to

be mistaken. Thus a swelling of this nature is in its earlier stages apt to be mistaken for an abscess. An exploratory puncture, however, will at once demonstrate the difference.

THE LARYNX.

Having completed the examination of the buccal cavity, the fauces and pharynx, the attention is next directed to the examination of the **larynx**. As already mentioned, alterations in the breath-sounds and in the voice are recognised and noted during the preliminary examination of the patient, and having thus made use of the sense of hearing, the parts are then viewed by means of the laryngoscope. With the light reflected by the forehead mirror, and brought to a focus on the patient's mouth, a laryngeal mirror of suitable size is taken. It should be held, not like a carving knife, but lightly, like a pen, between the thumb and fore and middle fingers of the right hand. Held thus, it may be raised or lowered, or moved in other directions freely and accurately, by almost imperceptible movements of the fingers. Before passing the mirror into the patient's mouth, it should be so treated as to prevent dulling of its reflecting surface by the condensation of moisture from the exhaled breath. This end may be attained either by heating the mirror, or by soaping it. When gas or oil is used as the source of light, the mirror may be held over the flame for a few seconds. In doing this, it should be held with the reflecting surface downwards, and it should be carefully observed while in this position. At first the mirror becomes clouded, then the cloud gets rapidly smaller, and the moment it has disappeared the mirror will be found to be warmed sufficiently. Great care must be taken never to examine a patient's larynx with an overheated mirror. To avoid an accident of this kind, by which the tissues may be injured and the

patient's confidence lost, the temperature of the mirror must be tested by touching the palm, or the back of the hand, with the mirror before passing it into the patient's mouth.

When using electric light as the illuminant the mirror may be warmed over the flame of a spirit lamp, or it may be placed in hot water, and where a table sterilizer is in use this is a convenient and cleanly method.

When these things cannot be had readily, the glass of the mirror may be rubbed over with soap, then polished with a soft cloth. The result is a bright clear surface on which moisture does not readily deposit.

The patient is then asked to protrude the tongue, which, after being covered by a single layer of towelling of fine texture, or a small "tongue cloth," to prevent its slipping from the grasp, is caught by the surgeon between the thumb and forefinger of the left hand—the thumb being above and the finger beneath the tongue. It is thus held gently but firmly, and while it is necessary to have it held steadily as well, special care must be taken to avoid traction, which is best accomplished by resting the middle or third finger of the same hand on the patient's chin. By keeping the forefinger slightly above the level of the teeth, the frænum and the lower surface of the tongue are protected against the sharp edge of the lower incisors, and this is of great importance to the patient's comfort. Excessive traction on the tongue and sawing of its under surface are errors committed by every beginner who has not been warned to guard against them. Occasionally it is necessary to get the patient to hold his own tongue in the protruded position.

The tongue being held as directed, with the mouth widely opened and the light falling on the fauces, the laryngeal mirror, suitably warmed, is then introduced. In its introduction it should be carried with its reflecting

surface downwards, midway between the tongue and the palate, care being taken to avoid contact with any of the surrounding parts until the posterior edge of the soft palate is reached. With the mirror resting here, against the base of the uvula, the soft palate is pushed upwards and backwards until it almost touches the posterior wall of the pharynx. The patient should then be requested to say **Ah!** or **Eh!** when, if the handle of the mirror is slowly raised, and at the same time moved towards the corner of the mouth, a full view of the interior of the larynx will, in the majority of cases, be afforded. It is well to practise the introduction of the laryngeal mirror with the left hand as well as with the right, as in the application of remedies, which can only be done accurately under the guidance of the eye, ambidexterity is necessary.

Before describing the laryngeal image, attention may be drawn to **some conditions which hinder** a full view of the larynx being obtained. And first, a beginner has considerable difficulty in arranging the light properly. He may find that when the laryngeal mirror is in position the light reflected by the forehead mirror is misdirected, or the illumination is insufficient. When such is the case, the laryngeal mirror should be at once withdrawn from the mouth, and the brightest light at command concentrated on the fauces by the readjustment of the forehead mirror before the re-introduction of the laryngeal mirror.

Again, from want of confidence the student may fail to place the mirror sufficiently far back. When such is the case, the base of the tongue, the glosso-epiglottic fossæ, and the lingual surface or lip of the epiglottis may be reflected in the mirror, a state of affairs which is at first puzzling, but which is readily remedied by gently pushing the mirror further backwards and upwards. Irritability of the fauces is a frequent source of trouble. This irritability varies in degree, retching beginning in some patients

before the mirror has fairly entered the mouth, while in others it is induced whenever the mirror touches the palate. When the patient is nervous or excitable, it is often well to introduce the mirror for a few seconds only and then to withdraw it, repeating this manœuvre frequently. By such means nervousness may be gradually overcome, and a full view of the parts obtained. When retching has been induced, the mirror should be withdrawn altogether, and its introduction should not again be attempted until the patient has had a distinct rest. A few sips of cold water is often of service in lessening this irritability. In former times a large dose of bromide of potassium was occasionally administered prior to a laryngeal examination, and the sucking of ice was frequently prescribed. Now, if the examination is not at once completely satisfactory, or if it is necessarily a prolonged one, the fauces may be anæsthetised with a 10 per cent. solution of *hydrochlorate of cocaine*, applied by means of a swab or spray. A small quantity so applied is perfectly harmless, and wonderfully efficacious. Considerable trouble is sometimes experienced from the presence of an elongated uvula, and also when the patient, disregarding instructions, will persist in breathing through the nose.

Enlargement of the tonsils occasionally acts as a hindrance to a satisfactory laryngeal examination, but by the use of an oval mirror in place of a circular one the examination may be made quite complete, even where the tonsils are much hypertrophied.

Lastly, the shape and position of the epiglottis may in many cases interfere with the proper view of the interior of the larynx. This is especially the case where the epiglottis is elongated and pendent, somewhat resembling the half-raised lid of a box. To illuminate the interior under such circumstances the mirror must be placed well back in the pharynx, and as far down as possible. When it is in this

position the patient should be requested to sound a high falsetto note, or to laugh, when the epiglottis will probably become erect. If the desired result is not thus attained, the parts may be anæsthetised with cocaine, and the epiglottis raised by means of a blunt hook, or by pressure on the glosso-epiglottic folds with a curved spatula.

The Laryngeal Image.—When the mirror is *in situ*, the relative position of the various structures and their appearance should be carefully observed. The extent of the view obtained varies greatly, depending to a considerable extent

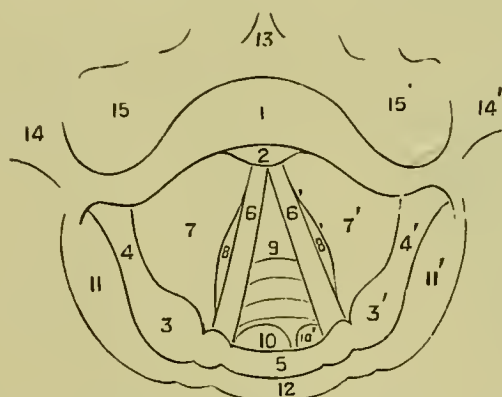


FIG. 7.—Outline diagram of the larynx and its immediate surroundings, as seen in a mirror from above:—1, Epiglottis; 2, cushion of epiglottis; 3, 3', right and left arytenoid prominence; 4, 4', right and left ary-epiglottic fold; 5, inter-arytenoid membrane; 6, 6', right and left vocal cord; 7, 7', right and left ventricular band; 8, 8', entrance to right and left ventricle; 9, anterior wall of larynx and trachea; 10, 10', right and left bronchus; 11, 11', right and left hyoid fossa or sinus pyriformis; 12, oesophagus; 13, central glosso-epiglottic ligament (*frenum epiglottidis*); 14, 14', right and left lateral glosso-epiglottic ligament; 15, 15', right and left glosso-epiglottic fossa.

on the position of the epiglottis. When that cartilage stands upright, not only can the interior of the larynx be readily illuminated and examined, but the trachea throughout its length may be viewed, and its division into right and left bronchi clearly seen.

At the upper part of the mirror will be found the **epiglottis**, the shape of which in different individuals is as various as is the form of the nose. In the great majority of cases the epiglottis is so curved that a portion of both its anterior and posterior surfaces are seen at one and the same time,

the posterior surface as it curves forwards being termed the **lip** of the epiglottis. Towards the lower part of the mirror are the two **arytenoid prominences**, these being the points at which the small cartilages of SANTORINI surmount the arytenoid cartilages. Stretching from the arytenoid prominence to the epiglottis on each side is the **aryteno-epiglottidean** fold (shortly, **ary-epiglottic** fold), and in this fold is the elevation on each side marking the position of the cartilage of WRISBERG. The two ary-epiglottic folds are united posteriorly by the **inter-arytenoid membrane**, or commissure, which varies in length and shape according to the

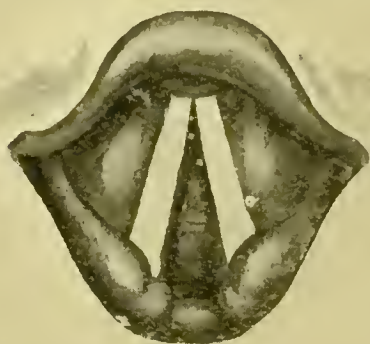


FIG. 8.—Position of the vocal cords during quiet respiration.

state of the glottis. During deep inspiration it is seen stretched between the two arytenoid cartilages, when it may in some cases be fully a quarter of an inch in length; whilst during phonation the space between the arytenoids is obliterated by the approximation of those carti-

lages, the membrane being folded up and directed backwards. Between those two extremes its length and shape vary greatly.

The structures mentioned, namely the epiglottis, the two ary-epiglottic folds and the inter-arytenoid membrane, together form an irregular circular boundary or frame-work within which are found certain important structures. Of these the **vocal cords**, two in number, are the most prominent, as they are the most important. They at once arrest the eye of the observer on account of their whiteness, which makes them stand out in marked contrast to the varying shades of pink of the parts around, and also on account of their free movements. When once seen, in their normal condition, they cannot be mistaken. These organs are flattened bands, each of which extends from the base of

one arytenoid cartilage to the angle of the thyroid cartilage, where they meet, and as seen in the mirror during quiet respiration they together represent an inverted **V**.

The space between the vocal cords is termed the **glottis** or **rima glottidis**, and it is ever changing in shape and size. During quiet respiration the glottis is triangular in form with the apex directed towards the epiglottis. During deep inspiration the tri-

angle becomes widened and the glottis may become lozenge-shaped on account of the turning outwards of the vocal process of each arytenoid cartilage. During phonation the vocal cords approximate and lie parallel to each other, so that the glottis may be represented by a single line. Some hold that during the emission of a high note one cord may overlap the other.



FIG. 10.—The position of the vocal cords during phonation.

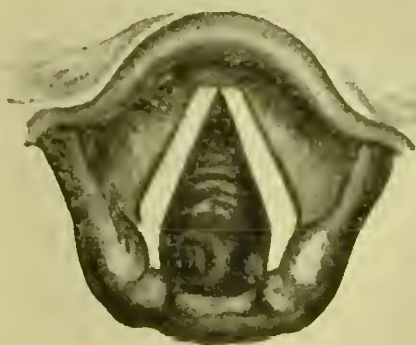


FIG. 9.—The position of the vocal cords during a deep inspiration. The cartilaginous rings on the anterior wall may be seen, and also the division of the trachea into the right and left bronchus.

On the laryngeal aspect of the epiglottis, and somewhat above the level of the anterior commissure, there is a rounded prominence described as the **cushion of the epiglottis**, which varies considerably in size in different individuals.

Between the vocal cord and the ary-epiglottic fold on each side there is the **ventricular band**, a reduplication of the lining mucous membrane, running parallel with the vocal cord. These ventricular bands have been called the “superior” or “false” vocal cords, on account of their position, being placed on a higher level in the larynx than the vocal cords proper, and also on account of their supposed action in the production of voice. Normally they have

little if anything to do with the actual production of voice, but when there has been extensive or complete destruction of the vocal cords, they may become, physiologically, true vocal cords, and I have observed them under such conditions assume that rôle.

The relationship between the ventricular band and vocal cord is best studied by means of a longitudinal section of

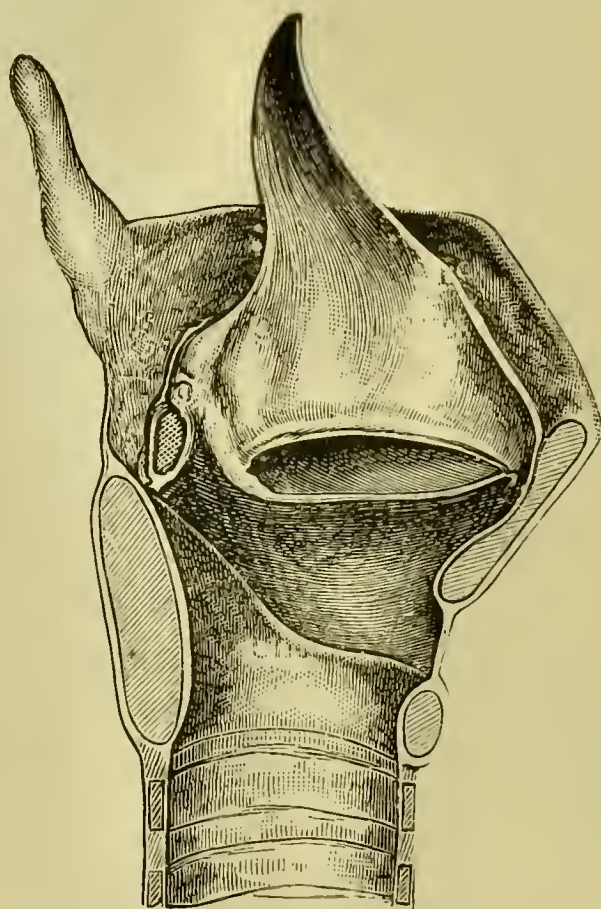


FIG. 11.—Vertical section of larynx in Author's collection, showing the relative positions of the ventricular band and vocal cord, with the entrance to the ventricle of the larynx between.

the larynx. The laryngeal image presented in the mirror is apt to give one the idea that the vocal cord is merely the white edge or border of the fleshy-looking ventricular band. In reality those parts are not only not continuous, but they do not even touch each other. The vocal cords are at a distinctly lower level than the ventricular bands, and this must be remembered when making topical applications. Between each ventricular band and vocal cord there is a

distinct aperture, which leads into the ventricle of the larynx, or ventricle of Morgagni.

A word may here be said regarding the mucous membrane with which the interior of the larynx is lined throughout, and which is continuous with that of the mouth and pharynx above, and with the trachea below. As it is reflected from the base of the tongue on to the anterior surface of the epiglottis it forms a central and two lateral reduplications, which are termed the glosso-epiglottidean folds, and between these there are two fossæ varying in depth. The mucous membrane is closely adherent to the anterior surface of the epiglottis, and also to the vocal cords, on which parts it is covered with epithelium of the squamous variety, is extremely thin, and in direct contact with the mucosa. The mucous membrane lining the narrow zone just within the entrance to the larynx is also covered with squamous epithelium. Throughout the greater part of the larynx, including the laryngeal surface of the epiglottis, the mucous membrane, like that lining the trachea and bronchi, has columnar and ciliated epithelium, and by the vibratory movements of the cilia, mucous secretion is directed upwards.

It is well to observe that in a healthy larynx the **colour** of its lining membrane varies at different parts. The lingual surface of the epiglottis is of a dull pink, while the curved, everted lip is yellow, owing to the colour of the cartilage shining through the pale pink mucous membrane; and the tubercle or cushion of the epiglottis, like its laryngeal surface, is bright red. This is apt to be mistaken for hyperæmia, and the mistake is the more likely on account of the rounded outline of the cushion. The ary-epiglottic folds are very similar in colour to the lips, with a lighter shade over the rounded prominences of the cartilages of Wrisberg and of Santorini. The inter-arytenoid fold is of a rather lighter shade, and sometimes it may even

be of a yellowish pink. The ventricular bands are deeper in colour than the ary-epiglottic folds, and the vocal cords are pearly white. When the trachea is visible the rings are seen to be of a yellowish colour, like the lip of the epiglottis; and the mucous membrane between those yellow elevated rings is of a pale pink.

It is to be remembered that the view of the larynx obtained by the aid of the laryngoscope is a **reflected** one and as such there are certain facts to be borne in mind. The observer during the examination is seated facing his patient, the patient's epiglottis therefore is the part of the larynx nearest to the observer, and the arytenoid cartilages with the inter-arytenoid membrane, forming the posterior wall, are the parts furthest removed from him. In making an examination, however, the epiglottis is seen at the upper part of the mirror, and appears furthest from the observer, while the parts forming the posterior wall occupy the lower part of the mirror, and so appear nearest to the observer. The part, then, which in reality is nearest to the observer is in the image furthest removed from him, and simply because the image is a reflected one. And for the same reason, as might be expected, there is no lateral inversion. As the patient sits facing the surgeon, his left hand is immediately opposite the surgeon's right hand, and so the vocal cord which is to the surgeon's right is the patient's left cord. The practical bearing of those points is brought home to one when making applications to any particular part of the larynx; and the difficulties of working under the guidance of the mirror are best appreciated and overcome by practice.

Changes in Colour and Form.—While the form of the larynx may be unchanged, there may be a more or less marked alteration in the colour of the lining membrane, either affecting the larynx generally or limited to some particular locality. The natural red colour may either be

paler or deeper than usual. Paleness or **anæmia** of the larynx may simply be evidence of general anæmia, and associated with a similar condition of the lips and fauces; or it may be the anæmia of early phthisis, in which case it is

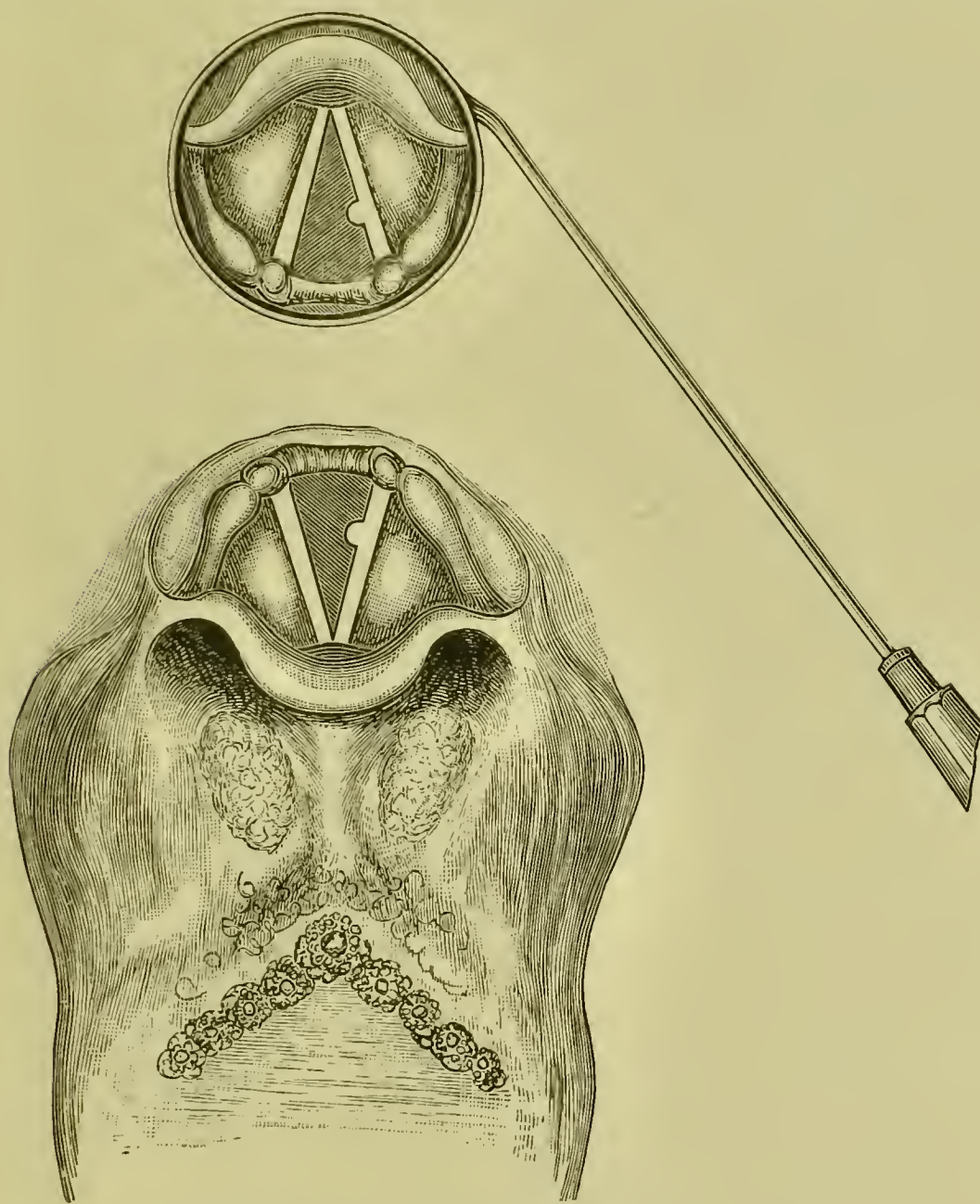


FIG. 12.—Relation of the parts in nature and in the mirror.

a sign of much importance. In this latter condition the pallor is extreme, and of a much more pronounced character than that of the neighbouring mucous surfaces.

Hyperæmia of the larynx may result from a variety of conditions. Prolonged use of the voice in speaking or in

singing, a paroxysm of coughing, inhalation of irritants suspended in the air in the form of solid particles, or of noxious fumes and the like, all tend to produce a general hyperæmia, though it may be of an evanescent character. Catarrh, from exposure to cold, produces a similar general injection of the parts. Hyperæmia, again, may be localised in almost any part; but this is specially the case with the vocal cords during the prevalence of a catarrh, when in place of flat pearly-white bands they appear rounded in form and pink in colour, and sometimes tiny vessels may be traced coursing over the surface of each.

Having by a general survey observed such changes as are present, the various parts are then examined in detail, and here, as with the fauces, it is well to do so methodically. The state of the veins at the base of the tongue should be observed. A congested condition of those veins is frequently a source of annoyance to a patient, and the appearance of blood in the expectoration, consequent on their rupture, is sometimes puzzling to the practitioner. The glosso-epiglottic ligaments, with the fossæ between must be carefully explored, especially when the lodgment of any foreign body is suspected. And under similar conditions the sinus pyriformis—that space between the inner surface of the thyroid cartilage and the ary-epiglottic fold on either side—must not be overlooked.

The **epiglottis** is then examined, both its anterior or lingual surface, its lip, and as much as can be seen of its laryngeal aspect. As has already been stated, the epiglottis may vary greatly in shape. It may have a wide curve with the upper edge or lip well curved towards the base of the tongue, and in such a case the interior of the larynx is readily inspected. On the other hand it may be broad and flat, and lie over and obscure the entrance to the larynx. Between these two extremes there is every variety in shape and position. In one form especially met with in children,

the epiglottis appears folded on itself laterally like a conduplicate leaf-bud. When it is of this shape, great patience and much manipulative ingenuity are necessary to enable the observer to obtain a view of the interior of the larynx. The form of the epiglottis, again, may be altered as a result of disease, and this is especially so as a result of syphilis. Limited portions may be destroyed, as shown in Fig. 13, which is a representation of what occurred in a man, thirty-five years of age, in whom that was the only part affected; or the upper portion may be wholly obliterated, in which case the upper edge may be on a level with the ary-epiglottic folds.

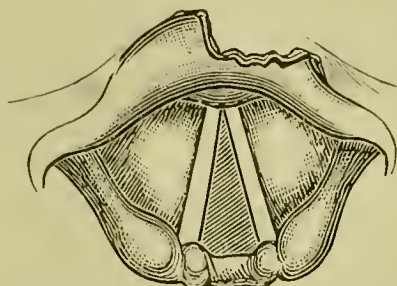


FIG. 13.—Syphilitic necrosis of portion of epiglottic cartilage.

Ulcers may be met with on any part of the epiglottis, and these may be nearly equally divided, as far as my experience both in hospital and private practice goes, into syphilitic and tubercular. In hospital practice syphilis is responsible for the greater number. Those due to syphilis may be of the nature of mucous patches, which have gone on to superficial erosion, and when occurring in this stage of the disease they are usually associated with mucous patches within the mouth or on the fauces, and, it may be, with evidences of the same disease on the skin. Syphilis in its later stages may manifest itself here, as elsewhere, in the form of gummata, the result of specific inflammatory infiltration, and when these break down, large and deep ulcers result. They most frequently affect the lip or upper edge of the epiglottis, and seldom occur on its laryngeal surface. These tertiary ulcers are large, irregular in outline, few in number, usually solitary, and surrounded as a rule by an area of inflammation. They cause pain usually during deglutition only, and frequently the pain is trifling when the size and position of the ulcer are considered.

In tuberculosis, the ulcers which form on the epiglottis are, in their earlier stages, small and circular. They are usually multiple—each ulcer being isolated—and they are scattered over the surface, though later on two or more may coalesce. They are located most frequently on the laryngeal surface of the epiglottis, sometimes on its upper edge, and the surrounding mucous membrane is usually unduly pale. Pain varying in severity is present in all cases, and is frequently out of all proportion to the size of the sores. When the ulcers, by spreading, coalesce, the cartilage may be exposed and a portion of it may become necrosed, this being followed in some cases by exfoliation (see Laryngeal syphilis and tuberculosis).

The **tolerance of manipulation**, which may be observed in cases of syphilis of the larynx, stands in such marked contrast to the hypersensitiveness found in most tubercular cases, that it might almost be included amongst the important differential signs.

The epiglottis is rarely the seat of an epitheliomatous ulcer, and when it is so affected it is usually by the spreading of the disease from some neighbouring structure. Cysts and papillomata springing from the surface of the epiglottis may be met with, but they are of rare occurrence, and when present are usually easily seen, and readily diagnosed.

Œdema of the epiglottis is an affection met with under a variety of conditions, and is usually of inflammatory origin. It may be the result of scalding of the parts, caused by the accidental swallowing of boiling water, etc., or it may be due to ulceration, tubercular ulceration of the epiglottis being usually accompanied by more or less œdema. It may also accompany syphilitic ulceration, though less frequently, but it is invariably present when there is destruction of the cartilage, whether this necrosis be tubercular or syphilitic in character. Again, there may be œdema of the epiglottis associated with a similar condition in other parts

of the larynx, as may be observed in some cases of acute catarrhal laryngitis, as a complication in Bright's disease, etc.

The appearance of the epiglottis when œdematous varies considerably. It is swollen, and the surface may be bright red in colour, or it may be of a purplish tinge, much resembling the inflamed œdematous prepuce seen in paraphimosis. In a case where I demonstrated this condition at my clinique in the Western Infirmary, the œdema was limited to the epiglottis, and was due to syphilitic necrosis of the cartilage. The appearance of the part was very similar to the patulous *os uteri*, as seen through a Fergusson's speculum—smooth, rounded, and dark red, with the surface moist and having a slit-like opening in the centre. In this case tracheotomy was performed for relief of the resulting dyspnœa. When œdema results from a chronic affection, the surface is usually pale and of a semi-translucent appearance.

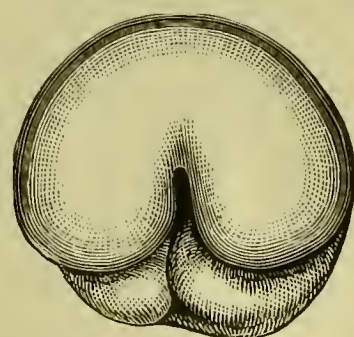


FIG. 14.—Œdema of the larynx.

Œdema of the ary-epiglottic folds is of more frequent occurrence than œdema of the epiglottis, or of any other portion of the larynx. The resulting swelling is most marked over the arytenoid prominence, where it appears as a smooth globular swelling, semi-translucent, sometimes pale in colour, but usually bright red, and in the majority of cases it is unilateral, or at least more pronounced on one side than on the other. Both may, however, be equally prominent. It may, like œdema of the epiglottis, be *primary*, as in acute laryngitis in otherwise healthy persons, or *secondary*, occurring as a sequel to ulceration of the surface, disease of the cartilages, etc. Œdema of the ary-epiglottic folds, and sometimes of the epiglottis, occurs in patients suffering from Bright's disease, the symptoms often appearing quite suddenly. It is not, however, as is frequently supposed, of a passive character, but is almost always the

result of inflammation. The more chronic the cause of the œdema the less is the risk to the patient's life; but in acute œdema, or that complicating an acute inflammation, such as results from scalds of the larynx, acute catarrhal laryngitis and the like, it may prove fatal within a few hours from the time of its onset if not relieved by operation.

Over the surface of the ary-epiglottic folds mucous patches, similar in appearance to those seen on the fauces, may be found; while one or other of the folds may be the site of ulcers, syphilitic or tubercular, and gummata may also be met with here. When one of the folds is the seat of a syphilitic infiltration, it is more or less swollen and prominent, deep red in colour, and its movements are hampered or, it may be, completely abolished.

The **inter-arytenoid membrane** should next be very carefully inspected, both as regards its upper border and its inner surface. In this latter situation is found, perhaps, the earliest indication of tubercular disease of the larynx, this appearing as a slight elevation of the mucous membrane of a rather paler tint than the surrounding surface (see Tubercle of the larynx). This may be found in cases where deposit can be detected in no other part of the body, and where the subjective signs alone raise the question of tubercle. Later on, this surface may be ulcerated, or it may be occupied by a mass of granulation tissue overhanging an ulcer which exists at a lower level (see Fig. 69).

The affections of the **ventricular bands** are very similar to those of the ary-epiglottic folds. They may become œdematous under similar conditions, but less frequently so than the ary-epiglottic folds. They may be thickened and injected from inflammation of a simple character, or as a result of syphilitic erosion or tubercular ulceration. Again, one or both of the ventricular bands may be the seat of syphilitic infiltration, and so great is the thickening sometimes found in those cases that not only may the vocal cord on the

affected side be hid from view, but its movements may be interfered with. When this condition exists there may be other evidences of syphilis, either in the form of active ulceration, or as cicatrices marking the sites of ulcers which have healed. The inner edge is a favourite site for a superficial syphilitic ulcer, and both ventricular bands may be thus affected. Tubercular ulcers are met with here, though not so frequently as in the epiglottic and ary-epiglottic folds; and occasionally the ventricular bands may be greatly increased in size, apart from œdema, as a consequence of tubercular deposit. Polypi may be found springing from those bands, and papillomata may also be found on their surface. When epithelioma occurs within the larynx the ventricular bands are, in many cases, first affected.

The vocal cords are next examined, and these, from their importance, call for the most careful scrutiny. Any alteration in colour or form, and any change, irregularity, or inequality in their movements must be carefully noted; as what in other situations might be considered a trivial deviation from the normal, may not only interfere markedly with the function of the cords, but may indicate an early stage of some serious disease where treatment, to be successful, must be inaugurated at the earliest possible moment.

As has already been noticed, the vocal cords may become injected where **hyperæmia** of the lining membrane of the larynx, from any cause, exists. When so affected, the vocal bands appear red and rounded, in place of being white and flat. This injection, which is at first general, may become limited in extent, affecting, it may be, one vocal cord or a particular portion of one or both; and this persistent localised hyperæmia is most frequently met with in those who, while suffering from laryngeal catarrh, continue to use the voice, as in teaching, etc. A red and white mottled or patchy appearance of the cords is sometimes observed in syphilitic hyperæmia of the larynx. Under the name of

chorditis tuberosa or *trachoma*, TÜRK of Vienna described a roughened condition of the surface of the cords resulting from the persistent use of the voice while the speaker or singer is suffering from laryngitis. It is a very chronic condition, is not uncommon, and from interference with the voice it is a constant source of annoyance to the patient. **Ulcers** occur at various parts of the cords and under varying conditions. They may appear as small and circular sores on any part of the surface of one or both; or they may be met with along the free edge, and from the consequent destruction of tissue the edge of the affected cord becomes irregular in outline, or it may be regularly irregular like the edge of a saw. These ulcers may be the result of syphilis or tuberculosis. In the former the destruction is usually more extensive and the sores less painful than when of the latter character, but differentiation will chiefly depend on the evidences of disease found in other parts of the larynx, in the chest, and elsewhere. In a syphilitic case recently under my care, the edges of both ventricular bands and of both vocal cords were eroded, so that in the same case, and at the same time, there was a double line of ulceration on each side of the glottis.

As a result of ulceration, one or both vocal cords may be destroyed in great part or entirely. Care must be taken to differentiate between actual absence of a vocal cord, and inability on the observer's part to see it, from, perhaps, swelling of a ventricular band.

New growths of a benign character may be met springing from the cords and appearing as projections on the mucous membrane. Of these there are three varieties—papillomata, mucous polypi and fibromata. When present they interfere with the clearness of the voice, the degree of interference being determined chiefly by the size and position of the new growth. A very small one, springing from the edge of one of the cords, may, by preventing their complete

approximation, cause huskiness or even aphonia. A larger one, and especially if it be pedunculated, may by its free mobility cause dyspnœa, the attack in some cases assuming an alarming aspect.

Of malignant growths which attack the cords epithelioma is the most common, and it may here occur either primarily, or secondarily to disease in neighbouring parts. Epithelioma of the cord may appear as a nodule, changing but little in appearance for a time; but as a rule it soon becomes ulcerated, the ulcer having ragged edges and its surface being coated with pus.

During a laryngoscopic examination, it is of the utmost importance to note the **movements of the vocal cords**, to see whether they are widely separated, and equally so, during deep inspiration, and if they approach the middle line equally and throughout their length during vocalisation. These movements may be disturbed from mechanical causes, as already indicated, or from nerve lesions which lead to paralysis. This paralysis may be partial or complete, unilateral or bilateral; it may result from central causes, or from interference with the nerves in their course. When muscular action is defective, but not entirely abolished, the term *paresis* is employed; *paralysis* when it is in complete abeyance.

Fixation of one vocal cord occurring in conjunction with an intra-laryngeal new growth is suggestive of malignancy in the latter.

The intrinsic muscles of the larynx derive their nervous supply from the recurrent laryngeal nerves—right and left—and are divided into two main groups, namely, the abductors or openers, and the adductors or closers, of the glottis.

Interference with the laryngeal nerves may either be in the form of *irritation*, or of *pressure*. The former produces spasm, which is usually confined to the muscles on the side

irritated, though all the intrinsic muscles may be affected, and if the abductors be specially involved, stridulous breathing and even suffocation may result. Laryngismus stridulus, or false croup, is of this nature.

Bilateral paralyses, other than those caused by pressure on the recurrent laryngeal nerves, are rarely of serious significance, the majority of such cases being hysterical. In these the adductor muscles are affected, so that the vocal cords remain apart, both during respiration and attempted phonation. Thus respiration is unaffected, but vocalisation is imperfect, and one having bilateral adductor laryngeal paralysis has aphonia and speaks in whispers. On examination the cords may be seen to occupy the position of quiet respiration, and they become more widely separated during deep inspiration, but when the patient is asked to phonate—to say Ah!—it will be found that while the cords may in a measure move towards the middle line they do not meet. If, however, a cough be induced, the vocal cords will be seen to come sharply up to the middle line, the glottis is closed, and the resulting cough is phonetic. In complete paralysis, caused by pressure on both recurrent nerves or from a serious central nerve lesion, the cords remain separate and immobile, and there is no attempt at their approximation during efforts at vocalisation or during the act of coughing.

Paresis or paralysis from pressure exerted on the recurrent laryngeal nerves is, in the great majority of cases, unilateral, though occasionally it is met with as a bilateral lesion. The most frequent cause is aneurism of the arch of the aorta, and in the majority of these cases the paralysis is met with on the left side. The reason for this is to be found in the difference in the anatomical relations of the two recurrent nerves. The left nerve arises more deeply in the chest than the right one, and as it branches off from the trunk of the pneumogastric it passes beneath and

behind the aorta, and is in such close proximity to the artery that it is readily affected by any increase in the size of that vessel. The other causes which may give rise to paralysis from pressure are tumours and enlarged glands in the mediastinum, cancer of the œsophagus, and tumours in the neck, especially those of a malignant nature.

In bilateral paralysis of the abductors, voice is but slightly interfered with, but inspiration is impeded, and that in proportion to the completeness of the paralysis. On examination the vocal cords will be seen either in the position of quiet respiration, or, if the paralysis is complete, they will be observed close together, if not actually in contact. This condition, which is only occasionally met with, I have seen in cases where both recurrent nerves were pressed upon by a carcinomatous tumour of the thyroid, by extensive epithelioma of the gullet, by extensive aneurism of the aorta, and as a result of syphilis.

When unilateral paralysis from pressure on a recurrent nerve exists, the fibres of the nerve supplying the abductor muscles are involved first. The result is that the paralysed cord remains fixed near to the middle line. During phonation the unaffected vocal cord moves up to the middle line to meet its paralysed neighbour. The resulting voice may be clear, and often is, but as there is a difference in the tension of the two cords, the voice is more frequently of a rough character. As the adductor fibres become involved, by increasing pressure on the nerve, the position of the paralysed cord becomes altered, until it assumes the cadaveric position, that is midway between complete abduction and adduction, where it remains fixed. The voice is then more rough, it is produced at the expense of considerable effort on the patient's part, and the cough is "brassy" in character. This form of paralysis is most frequently associated with aneurism of the arch of the aorta, and the paralysis may be present, and easily diagnosed

long before any other physical sign of aneurism can be detected.

When pressure results simply in paresis, the vocal cord on the affected side may approximate its fellow during phonation, but it moves more sluggishly and becomes more readily exhausted, so that after a time its movements become slower and less perfect.

Other conditions due to interference with the innervation of the parts, such as stammering, spasm, and chorea of the vocal cords, are described in the chapter on neuroses of the larynx, where diagrams illustrative of many of these paralysees will also be found.

While using the laryngeal mirror, if the patient inspires deeply, the anterior wall of the larynx beneath the level of the vocal cords, and the trachea, even to its division into right and left bronchi, may be clearly seen. The appearance of these parts when healthy has already been described. In chronic laryngitis, the lining membrane of the larynx below the glottis may be deeply injected, or it may be hypertrophied as a result of the continued inflammation. Of more importance, as it is more common and more dangerous to life, is œdema of the parts beneath the cords—subglottic œdema—first described by Dr. Gibb in his *Diseases of the Throat and Windpipe* (London, 1864). It is frequently associated with acute laryngitis; some later authorities consider it to be closely associated with the gouty diathesis, and in children it may appear suddenly after exposure to cold, resulting in symptoms referred to as “false croup.” On examination the swollen infiltrated submucous tissue may be seen as a red rounded projection beneath the vocal cords. The sudden and severe dyspnoea which it occasions, necessitates, in some cases, the performance of tracheotomy, or intubation of the larynx, for its relief.

OTHER METHODS EMPLOYED IN THE EXAMINATION
OF THE LARYNX.

In place of having the light reflected into the patient's mouth by means of the forehead mirror, the surgeon may wear an electric lamp over his forehead, from which the light is directly thrown on to the patient's fauces and pharynx. Trouvé's photophore is perhaps the best known form of apparatus designed for this purpose, and when the required supply of current is at hand this method of illumination is specially useful in operative work.

Another form of laryngoscope consists of a laryngeal mirror, with a small electric lamp fixed to its stem close up to the mirror. If, when the mirror is in position, the circuit be closed by pressure on the small button on the handle, the film of the lamp becomes incandescent, and the light is directed downwards from the reflected surface to illuminate the interior of the larynx, thus doing away with the use of the forehead mirror.

DIRECT LARYNGOSCOPY.

To examine the interior of the larynx without the intervention of mirrors has often been attempted, and the most successful apparatus for this purpose is Dr. Alfred Kirstern's "autoscop." This instrument resembles a much enlarged tongue depressor. The spatula portion, made of steel, is broad, hollowed down the middle, and at its free end is thickened, curved downwards and notched in the centre of its extremity. The spatula portion is fixed at right angles to a handle, similar to the handle of Kaspar's electroscope. The handle contains a small electric lamp at its upper end, the light from which is focussed through a convex lens, and then deflected 90 degrees by a small

prism. By these means a bright light is directed along the upper surface of the spatula to illuminate the parts beyond.

In the application of the instrument the surgeon stands in front of the patient, who sits in a chair with the neck thrown slightly forwards, and having the face in an upright direction. The instrument is connected with a battery, and when illumination is desired the current is closed by pressure on a spring, and the lamp lit. The inventor, in describing the application of the instrument, divides it into three stages :

In the first, it is used like an ordinary tongue depressor for the examination of the cavity of the mouth, the fauces, and the buccal pharynx.

In the second, the spatula is passed further backwards, the handle is gradually raised, and at the same time pressure, in a downward and forward direction, is exerted upon the base of the tongue. In this position the lower portion of the pharynx is brought into view, and the anterior surface of the epiglottis, the epiglottic ligaments, and the glosso-epiglottic fossæ can be fully examined.

In the third position, that for examination of the interior of the larynx and trachea, the handle is still further raised until the upper surface of the sliding hood comes into contact with the upper incisor teeth. The teeth, however, must on no account be used as a fulcrum to increase pressure on the base of the tongue, and when artificial teeth are present they should be removed prior to the introduction of the instrument. The various changes in the position of the instrument should be made under the guidance of the eye. In this third position the central glosso-epiglottic ligament should lie in the notch of the distal end of the spatula, and it will be observed, when pressure is exerted at this point, that the epiglottis may be so elevated as to expose the laryngeal cavity for inspection.



FIG. 15.—Position of patient and surgeon for direct laryngoscopy, and for the performance of intra-laryngeal operations when using the "autoscop."

The arytenoid prominences, the inter-arytenoid membrane, and the posterior portions of the ary-epiglottic folds are readily seen in most cases. In tolerant subjects, the ventricular bands and vocal cords can be seen throughout the posterior half, or it may be two-thirds, of their entire length.

Considerable difficulty in its manipulation is at first experienced, but, as with most things, its application becomes easier, and the results are more satisfactory the more frequently it is used. Without attempting to go into details, the conclusions come to by me after considerable experience with it may be stated shortly as follows :

For examining the fauces and the buccal pharynx—"the first position" in its application—it is a cumbersome apparatus, and inferior to an ordinary tongue depressor.

For examination of the epiglottis and the deep portion of the pharynx it is useful in many cases.

Its chief value is in the examination of the posterior wall of the larynx, viz. the arytenoids and the inter-arytenoid membrane. On the laryngeal aspect of the inter-arytenoid membrane we frequently have serious lesions to deal with, and these cannot be fully brought into view with the ordinary laryngeal mirror. By means of this instrument we can, in many cases, look directly on to this surface, not merely on to its upper border, but well down to and below the site of attachment of the vocal cords, and thus the extent of pachydermiæ, mammiloid growths, and ulcers, which so frequently affect this area, can be fully determined.

Irritability of the throat and the position of the epiglottis, as in ordinary laryngoscopy, are the chief obstacles to be overcome before a satisfactory view of the parts can be obtained. The former may be greatly modified by the judicious use of cocaine applied prior to attempts at examination; and an overhanging epiglottis can be sufficiently elevated in the majority of cases by firm pressure on the

base of the tongue, and through it on the glosso-epiglottic ligaments.

While it may be stated that this instrument will never supplant the laryngoscope for the routine examination of the larynx, it will be found to be of great assistance in the examination of the inter-arytenoid area, and in the making of direct applications to that surface. This, to my mind, is of great importance in laryngeal work.

TRACHEOSCOPY AND BRONCHOSCOPY.

On lines similar to those adopted by Kirstein for direct laryngoscopy, Dr. Gustav Killian of Freiburg introduced an apparatus consisting of a series of tubes for the direct inspection of the interior of the trachea and bronchi.

For direct tracheoscopy in the adult he uses a 25 per cent. alcoholic solution of cocaine as a local anæsthetic, with, in many cases, a preliminary injection of morphine, and the patient during examination is seated in the upright position. In children he uses chloroform, and during the examination has the patient's head hanging over the edge of the table.

The tubes are straight and vary in length and diameter, but in each case the tube selected must be small enough to get through the rima glottides without doing any injury to the parts. These tubes may be fixed to a Kaspar's handle, the same as is employed in Kirstein's apparatus, and which, as already stated, is furnished with an electric lamp behind a prism, by means of which the tube and the parts beyond are illuminated, or the tube may be fixed to a handle like that of a tongue depressor, and illumination got from an electric lamp worn on the forehead. The tube should be introduced in all cases under the guidance of the eye, with or without the help of the finger; and during its passage the examiner should look continuously through the tube,

carefully watching its passage through the pharynx, the larynx, and the trachea.

For bronchoscopy longer tubes are employed, and these are introduced into the previously cocainised bronchi. Dr. Killian says that "we may, without fear, press the bronchi (which are highly elastic tubes embedded in soft tissue) into the median line, and thus bring the trachea, and the larger bronchi, into one straight line." Thus out of the upper and lower tracheoscopy his method of upper and lower bronchoscopy has been evolved. Bronchoscopy, he holds, allows the whole bronchial tree to be searched. Although the left principal bronchus branches off at a sharper lateral angle than the right one, it is, through gentle pressure, brought almost as easily into view as the right. While tracheoscopy and bronchoscopy may in rare instances be useful in the diagnoses of deeply seated obscure lesions, they have been employed chiefly and most successfully, in the detection and removal of foreign bodies impacted in the trachea and bronchi.

AUTO-LARYNGOSCOPY.

To enable a beginner to practise laryngoscopy, to acquire the necessary delicacy of touch, to gain ease in the use of the mirror, and to become familiar with the appearances of the larynx, systematic examination of one's own throat has many advantages. The auto-laryngoscope invented by the late Dr. David Foulis of Glasgow is one of the simplest, and consists of a glass globe filled with water and surmounted by a small square mirror. A lighted candle is placed behind the globe, and the observer sits in front of it, and when the mouth is opened the rays from the candle are concentrated on his pharynx. If the laryngeal mirror is then passed into the mouth and placed as for laryngoscopic examination, the resulting image will be seen in the mirror which surmounts the globe.

CHAPTER II.

ACUTE INFLAMMATIONS OF THE FAUCES AND PHARYNX.

ACUTE inflammation of the fauces and pharynx, while most frequently of catarrhal origin, and usually described as **idiopathic**, may result from a local infection—**septic**—or from injury—**traumatic**—or it may appear as one of the symptoms of a general systemic disturbance due to some **toxic** cause.

(1) **Idiopathic Pharyngitis.**

Acute catarrhal inflammation of the mucous membrane of the fauces and pharynx is of common occurrence in this country, and affects both young and old.

Etiology.—There are many conditions which predispose to such an attack, but they may be roughly included under the description of “anything which tends to lower the vital powers”; and the apparent exciting cause is usually to be found in a sudden rise or fall in the temperature, and especially when associated with excessive moisture in the atmosphere. Passing out into the night air from an over-heated and possibly over-crowded room, may be quickly followed by an acute faucial and pharyngeal catarrh, and a similar result may follow the sudden advent of a “hot

wave" in summer. It is difficult to fully explain the process, but it may be that the sudden change of temperature, by lowering the resisting power of those parts, opens the way for microbial invasion.

Symptoms.—The symptoms vary with the severity of the attack, and the onset may be associated with a certain amount of feverishness and general malaise. When of catarrhal origin, the earliest local symptom is a hot, dry feeling, with a sense of stiffness of the throat, and accompanied by an itching sensation in the eyes, ears, or nose, or at the back of the throat. No matter where it begins it always tends to spread. If it originates on the pharyngeal wall it may spread upwards towards the nose, and towards and along the Eustachian tubes, and it may even extend to, and affect, the lining membrane of the middle ear. Thus, pain in one or both ears, accompanied by deafness, may be associated with this condition. On the other hand, the inflammatory process may extend downwards, affecting the whole of the pharynx, the larynx, the trachea, and bronchi, resulting, it may be, in a sharp attack of bronchitis. (When the inflammatory process is confined to the nose it is termed *coryza* or *rhinitis*; to the fauces, *faucitis*; to the pharynx, *pharyngitis*; to the larynx, *laryngitis*, and to the trachea, *tracheitis*.) There is redness, swelling, and dryness of the surfaces affected. From this cause the nose may be obstructed, the fauces and pharynx may be swollen and uncomfortable, and there may even be pain and difficulty in swallowing, in breathing, and in speaking.

On inspection a diffuse redness will be seen, affecting the palate, the fauces, and the buccal pharynx alike. The swelling of the mucous membrane is also general, but the tonsils and uvula are frequently specially involved, and as a result the tonsils are increased in size, and the uvula may be elongated, or it may become œdematous. The temperature in the earlier stage is usually increased by

one or two degrees. Within a variable time the dry stage is followed by a condition, the chief feature of which is copious secretion. The secretion, sometimes watery, but usually mucoid and viscid in character, becomes mucopurulent as the inflammatory process subsides.

Diagnosis.—A bright and general injection of the mucous membrane of the palate, fauces, and pharynx, is met with as an early symptom of scarlet fever, as one of the first manifestations of constitutional syphilis, and as a result of the excessive imbibition of alcohol. Before concluding then that the condition under examination is of a simple catarrhal character, it is well to “check” the diagnosis by considering the patient’s age, by inquiring into his habits, and by searching for corroborative evidence which, whether positive or negative in character, is equally important.

Prognosis.—Under favourable conditions, and in a healthy patient, resolution takes place within a few days, and by the end of two or three weeks, at most, the parts will have resumed their normal appearance. When, however, the patient is in low health, or placed in unhealthy surroundings, the acute inflammatory attack may terminate in a chronic condition—in thickening and relaxation of the various mucous surfaces involved.

Treatment.—(a) *General.* When the condition is acute it is advisable to insist on the patient remaining indoors, if not actually in bed. He should have warm diluent drinks administered, and the diet should be restricted to light farinaceous food and soups. The discomfort in the throat may be relieved by a wet compress over the neck: and during the dry stage the inhalation of steam, alone or impregnated with some volatile sedative, is soothing, and when it does not cut short the attack it hastens the second stage. A dose of from ten to fifteen minims of spirits of camphor on lump sugar begun early, and repeated at frequent intervals, occasionally checks, and always shortens

the duration of the attack. When there is elevation of temperature it is well to begin treatment with a saline purgative, to be followed by the administration of a diaphoretic, such as 12-15 grs. of Dover's powder, with 3-5 grs. of nitrate of potash; or what in the majority of cases is more efficacious, tincture of aconite, given as recommended by Dr. Sidney Ringer, in doses of 1 minim every hour. The patient must, during the administration of aconite, be confined to bed. Aconite acts locally in allaying the hyperæmia as well as in rapidly reducing the accompanying fever.

(b) *Local.* When the parts are highly inflamed the act of gargling is painful, so that gargling should not be recommended; but a weak astringent or sedative gargle may be prescribed with which to lave the fauces and pharynx, and to be used as a mouth-wash. Cocaine, in the form of lozenge, and combined with a sialogogue such as chlorate of potash, is frequently of great service. By such a combination pain is relieved and the inflamed surface is kept clean. Where the pain is less severe, frequent sips of hot water and the use of marsh mallow lozenges have a soothing and cleansing effect. As lozenges and pastilles tend to upset digestion, they should be used sparingly. The direct application of nitrate of silver solution (2%–4%) in the early stage may check the further extension of the inflammatory process.

When the more acute stage passes away, the secretions become more tenacious and difficult of dislodgment. In this stage lozenges containing chloride of ammonium are helpful, as is also spraying the surfaces with guaiacol in olive or almond oil, or menthol dissolved in liquid vaseline.

(2) Septic Pharyngitis.

Erysipelas of the fauces and pharynx, phlegmon of the pharynx and larynx, hospital sore throat and angina

Ludovici, all of which have been described as different diseases, have recently been shown to be pathologically identical, and to be dependent on the presence of the streptococcus pyogenes. The difference between these is mainly one of degree, and depends chiefly on the virulence of the poison, the site of the local infection, and the state of the patient's general health.

Etiology.—The causes which *predispose* to acute septic pharyngitis are lowered vitality and any morbid condition within the mouth which may cause abrasion of the mucosa: and the *exciting cause* is septic infection.

Symptoms.—In the less severe cases the whole pharynx becomes swollen and of a deep dusky red colour, while the uvula becomes swollen and œdematous; and the tonsils may share in the rapidly spreading inflammatory action.

Where the process is more acute, the swollen uvula may become gangrenous, and portions of the tonsils and the wall of the pharynx may slough. In its progress the inflammation may spread to the larynx, and to the glands and deep tissues of the neck.

At first much pain may be complained of, then as the swelling becomes more pronounced deglutition is painful, or it may be impossible, and respiration is impeded. When sloughing occurs the foetor of the breath is sickening.

The general symptoms are those of profound septic poisoning, setting in with a rigor and elevation of temperature. When of the asthenic type it rarely rises above 102° F., but in other cases it may rapidly rise to 105° F. or 106° F. This high temperature may at first be accompanied by a dry skin, but later there are profuse perspirations. In cases which end fatally, the pulse loses in strength and increases in rate, the patient becomes prostrate, and increasingly delirious, he may have convulsions, and finally becomes comatose.

Diagnosis.—The rapidity of its onset, the acuteness of

the local process and the patient's general condition are usually sufficient evidence on which to make a diagnosis. But, in addition, some secretion should be taken from the throat with a swab for bacteriological examination.

Prognosis.—The prognosis depends (*a*) on the severity of the local process, which by extension downwards may lead to œdema of the glottis, and (*b*) on the degree of septic absorption.

Treatment.—If the streptococcus pyogenes be found in the secretion taken from the throat, anti-streptococcic serum should be given without delay, in doses of from 10 to 20 c.c.

The patient's general strength must be supported by plentiful supplies of warm, easily digested nourishing food chiefly in fluid form. Where pain interferes with swallowing, it may be relieved by the application of cocaine prior to the taking of food, and alimentation may be added to by rectal feeding. Where there are spasms of pain, bromide of potassium may be given as required.

Locally, antiseptics should be used. First the surfaces should be well cleansed with peroxide of hydrogen (20 vols.), and this may be followed, in the less severe cases, by painting the surfaces with glycerine of carbolic acid (1 in 10), solution of perchloride of mercury, or other efficient germicide. Where destruction of tissue occurs, peroxide of hydrogen solution should be used freely, followed by glycerine of carbolic acid (1 in 5), or a strong solution of chromic acid (1 in 3), and the sloughing tissues should be clipped away as early as possible.

(3) Traumatic Pharyngitis.

Etiology.—The pharyngeal wall may be injured in a variety of ways. It may be *scalded* by drinking boiling water, an accident most frequently met with in children. It may be *burned* by the accidental or intentional swallow-

ing of caustic or corrosive liquids, such as carbolic acid or strong solutions of ammonia. Where carbolic acid has been the cause it has usually been swallowed with suicidal intent, while in cases of burning with ammonia the fluid has in most cases been taken in mistake for whisky. Accidents of this kind are on the increase, because of the almost universal use of strong solutions of ammonia for domestic purposes, and the storage of it in black quart bottles.

Again, the pharyngeal wall may be *scratched* or *torn* by the accidental swallowing of hard, rough, or sharp bodies, such as a hard crust, a piece of wood or glass, fish bones, pins, and the like. Lastly, the pharyngeal wall may be seriously injured by the forcible, direct impact of bodies, such as a pencil, a whistle, or a pipe-stem. One of several cases of this kind which I have seen was that of a child four years old, who, while running about amusing himself by blowing through a tin whistle, tripped and fell. In falling, the whistle first came in contact with the ground, and thus thrust backwards, it tore the lower border of the soft palate and made a large ragged wound on the posterior wall of the pharynx. Suddenly, at the end of two days, during which time the wound appeared healthy and was healing, the child's life was threatened by the appearance of œdema glottidis, accompanied by such urgent symptoms as to necessitate an immediate tracheotomy.

Symptoms.—The fauces and pharynx do not usually suffer so seriously from the swallowing of hot or corrosive fluids as do the gullet and the upper border of the larynx. The symptoms are therefore referred chiefly to those regions. Continuous pain, often very severe and increased by every attempt at swallowing, is present in almost every case. In some instances the patient may be wholly unable to swallow; and where the laryngeal mucosa has been injured, sudden and urgent dyspnœa, caused by the onset of œdema, may occur.

Where the surface has been pricked, scratched, or torn, much pain may be complained of until the wound has become healed.

Prognosis.—In cases of scalding and burning with caustic fluids there are three dangers; the first is œdema glottidis, the second is general septic poisoning, and the third is cicatrization and consequent contraction of the gullet, all of which are serious, and any of them may prove fatal.

Scratches, abrasions, and wounds usually heal satisfactorily.

Diagnosis.—Given the history, the diagnosis is easy. But in cases where caustic fluids have been swallowed, it is often impossible at a first examination to ascertain the extent of surface affected, or how deeply the tissues may have been destroyed.

By way of illustration, the following case is of much interest. A man aged fifty, on returning from his work one evening, found on entering the kitchen a black quart bottle on the table. This he at once laid hold of, and, putting the bottle to his mouth, gulped down a quantity, when to his horror he found that it contained not whisky, but liquid ammonia used by his wife for the washing of clothes. On examination a few hours later the palate, fauces, pharynx and larynx were found to be deeply injected, and considerably swollen and bleeding. On the following day there was a grayish exudation over the uvula and the free border of the palate, any interference with which caused the surface to bleed. There was a similar exudation over the lip of the epiglottis and over the posterior half of each ary-epiglottic fold; and both arytenoid eminences were œdematous. Any attempt at swallowing caused severe pain, chiefly about the level of the larynx, but by the end of eight days, when he was dismissed from the hospital, pain on swallowing had practically gone, the exudation had been cast off, and the parts affected had almost assumed their normal appearance.

Two and a half months later he returned, on account of

increasing difficulty in swallowing. He could then swallow fluids only ; these passed down very slowly and had to be taken cautiously. No trace remained of the former injuries to the fauces, pharynx, and larynx. On examining the œsophagus two strictures were discovered, one close to the mouth of the gullet and the other at a distance of $12\frac{3}{4}$ inches from the incisor teeth.

Treatment.—If the injury be from burning or scalding, and the patient is seen immediately, the surfaces may be soothed, and the further action of the caustic checked, by the administration of olive oil or vinegar well diluted. A solution of bicarbonate of soda in the case of an acid may be similarly beneficial.

Subsequent treatment should be conducted on general lines, including the administration of bland fluids, soothing applications in the form of lozenge, spray, or inhalation ; and pain may be further controlled or relieved by the use of cocaine or morphia.

Where the destructive action has been severe and sloughing follows, the frequent application of antiseptics should be employed as in septic pharyngitis, and these should be followed by astringent and stimulating applications to hasten the healing process.

Wounds of the pharynx may be kept clean by the frequent sipping of hot water or of warm boracic solution, and by spraying with antiseptics. The pain of a scratch or cut, which may take on a spasmodic character and interfere with deglutition, may be relieved by the use of the bromides. And should an abscess result from the injury it should be opened as soon as the presence of pus is detected.

(4) Toxic Pharyngitis.

Under this title are included inflammations of the pharynx dependent on gout and rheumatism ; those occur-

ring during the course of the exanthemata and the specific fevers, as well as those resulting from the action of various drugs, such as mercury, lead, iodide of potassium, arsenic, and others.

RETRO-PHARYNGEAL ABSCESS.

Retro-pharyngeal or post-pharyngeal abscess is a collection of pus lying between the posterior wall of the pharynx and the bodies of the vertebræ. It is most commonly met with in children.

Etiology.—It may follow an injury, it may result from septic infection, or it may occur during the course of scarlet fever, in all of which cases it takes the form of an acute abscess. The abscess in this acute form is, however, of less frequent occurrence than is the chronic abscess. The latter may be secondary to spinal caries, though in my experience suppuration of the deep cervical or retro-pharyngeal glands is a much more frequent cause. These chronic abscesses are often described as idiopathic, but in most instances they are tubercular, and the tuberculous infection is a result of a chronic inflammatory affection of the nose or nasopharynx.

Symptoms.—When the abscess is acute, considerable pain may be complained of, but noisy respiration and difficulty in swallowing are the symptoms which first direct attention to the presence of an abscess, whether it be acute or chronic; and these symptoms become more evident as the swelling increases in size.

When the abscess is confined to the buccal pharynx the changes in the breath-sounds and in the voice closely resemble those which accompany the presence of enlarged tonsils, and when it is situated at a lower level, dysphagia and dyspnœa are more pronounced, and the latter may be paroxysmal.

PLATE I.



A post-pharyngeal abscess, the result of suppuration in a deep cervical gland.

When the abscess is due to suppuration of the deep cervical glands, there may be glandular swellings in the neck: and when the abscess is the result of caries of the cervical vertebræ, there may be no other symptoms pointing to disease of the bone present at that stage, but this will in all probability develop as the suppurative process progresses. There is a frequent cough to dislodge mucus, and the voice and speech are altered in character.

Diagnosis.—If the abscess be situated in the buccal pharynx the posterior wall of the pharynx will, on examination, be seen to bulge towards the mouth, and it may become so prominent as to lie in contact with the soft palate. The swelling is smooth and rounded, moderately tense and fluctuant, and it usually lies to one or other side of the middle line. As it is situated behind the posterior pillar, it should not be mistaken for an affection of the tonsil. Palpation of the swelling should be employed in every case; in abscess at a low level in young children it is the chief means of making a diagnosis.

Prognosis.—When the abscess is acute it may run a rapid course, and if not opened it may burst spontaneously within ten days, and heal satisfactorily. In the chronic form due to glandular suppuration, the prognosis is in most cases favourable; but when it is the result of disease of the vertebræ, while the immediate outlook may be good, the ultimate result may be serious and probably fatal. And where recovery does take place there will probably be some permanent spinal deformity.

Where the abscess bursts, the pus may be coughed up or it may be swallowed, or it may enter the larynx, and, if in quantity, may cause asphyxia. In place of bursting, the pus may burrow or gravitate downwards and into the posterior mediastinum, setting up a fatal acute mediastinitis.

Treatment.—Treatment in all cases consists of the prompt evacuation of the abscess, and when in a child, preferably

under a general anæsthetic. The abscess may be opened (a) through the mouth or (b) by an external incision.

(a) If the abscess be large the pus may first be drawn off through the mouth by means of an aspirator or a trocar and canula, in order to avoid the risk of the pus being swallowed or inhaled, after which the abscess cavity is freely opened with a knife. Or the abscess may be opened direct through the mouth. In either case the naso-pharynx should first be packed with sterile gauze, and the patient's head either turned to one side or extended over the end of the table. So soon as the abscess is incised, the pus is mopped up from the pharynx and mouth with swabs, and if the operation be carried out in this way there is no danger whatever of pus being either inhaled or swallowed. The abscess cavity should be freely exposed in every instance, and the interior thoroughly cleared out with a Volkmann spoon and gauze swabs. Until the cavity is closed, the pharynx should be cleansed at intervals by swabbing with antiseptic lotions, and by the frequent sipping of hot water.

(b) In the external operation the abscess is reached through an incision made behind, and in a line with, the sterno-mastoid. The chief advantage of this method is that it can be carried out under complete antiseptic conditions.

After the evacuation of the abscess, attention must be given to the improvement of the patient's general health. When the abscess is the result of disease of the vertebræ, the bony column should be fixed by a form of collar, so that the neck is rendered rigid, and the weight of the head is, through the apparatus, transferred to the shoulders; or by the use of the jury-mast, in conjunction with a Sayre's plaster-jacket.

In the earlier stages of those cases associated with disease of the vertebral column, there may be no direct evidence of this being the cause, even when the abscess is

opened, but as time goes on the symptoms which develop—deformity, etc.—leave no room for doubt.

The following case which was under my care in the Western Infirmary illustrates the readiness with which a retro-pharyngeal abscess, unconnected with any deep-seated disease, heals after being treated in the way described.

A child $2\frac{1}{2}$ years old had had, during the previous six months, increasing difficulty in breathing and swallowing. The voice and respirations closely resembled those of a child with greatly enlarged tonsils. Sleep, which could only be obtained while the child was lying face downwards, was much broken; the child throughout the night was very restless, and respirations, which were accompanied by a loud snoring noise, were irregular. On examination the bulging of the buccal pharynx was very evident, and on palpation the swelling, which was fluctuant, was found to extend downwards to the level of the upper border of the thyroid cartilage. With the mouth gagged the abscess was freely incised and its contents cleaned out. On the third day, by which time healing of the wound was well advanced, respirations were unobstructed, regular, and free from noise, and there was no difficulty in swallowing.

CHAPTER III.

CHRONIC INFLAMMATIONS OF THE FAUCES AND PHARYNX.

Chronic catarrh of the fauces, sometimes described as **relaxed sore throat** is usually associated with a similar affection of the pharynx, and may occur as a result of one or more attacks of acute catarrhal inflammation; or it may appear independently, from, amongst other causes, disorders of digestion, or as a result of exposure to rapid changes in temperature, to cold winds, to night air, or to noxious vapours.

Symptoms.—In many cases there are no symptoms. In others there is a frequent tickling cough, the irritation being confined to the back of the throat, with hawking of tenacious mucus, and a feeling of dryness in the throat, especially on waking in the morning. The relaxed uvula which, by irritation of the tongue and fauces, is the chief cause of the troublesome cough, may, by irritating the pharynx, cause retching or actual sickness, and sometimes it even produces spasm of the larynx. This latter symptom usually occurs during sleep, and is caused by the sucking-in of the elongated uvula into the larynx during inspiration. Pain is seldom complained of, and when present it is of an indefinite character.

Diagnosis.—On **examination** the fauces and pharynx are

seen to be pale, with, in some cases, engorged vessels coursing irregularly over the surface. The parts generally are thickened, and the uvula elongated and pendulous. If there is much hypertrophy, the enlarged uvula may be club-shaped, but where the mucous membrane is alone involved it is attenuated and tapers to a fine point. When the mouth is at first opened the uvula may be drawn up by contraction of the *azygos uvulæ*, and its relaxed condition, as a consequence, may be overlooked; but if the patient be requested to breathe for a time through the widely opened mouth, the uvula will be seen to gradually descend until its extremity touches and then finally rests on the dorsum of the tongue. A similar relaxed state of the palate and uvula may be seen when there is paralysis of the palate, a condition occasionally met with as a sequel to diphtheria. In this case there is no puckering up of the uvula when the patient first opens the mouth for inspection, and if the parts are touched, reflex movements are found to be absent.

Treatment.—General tonic treatment is called for in the majority of cases. It may be in the form of dry bracing air, or of medicinal preparations, chief amongst which are the mineral acids, iron and quinine with bitter infusions, with the addition of saline aperient waters, when these are required.

Local treatment is invariably required. Where there is much local irritability, treatment may be begun by inhalations of steam, alone or impregnated with some volatile sedative, such as camphor or compound tincture of benzoin, both of which are stimulating as well as sedative in their action. After the venous congestion and the accompanying pain or uneasiness have been lessened by such means, mild local astringents are necessary, and they are most readily and most pleasantly employed in the form of lozenge. Rhatany pastilles, with or without cocaine, or the Rhatany,

Catechu or Kino lozenges of the London Throat Hospital Pharmacopœia will be found useful.

When there is hypertrophy and elongation of the uvula it may be necessary to remove a portion of it. The method by which this is accomplished is described in Chapter IV.

CHRONIC PHARYNGITIS.

Chronic pharyngitis occurs in a variety of forms. In some the mucous membrane, with the mucous glands, is chiefly implicated, while in others the process at work appears to be largely confined to the adenoid tissue. Chronic pharyngitis may follow on an acute attack, though this is rather the exception. Disturbances of digestion and the gouty and rheumatic diatheses are among the more common determining causes, so that chronic pharyngitis is more often a symptom of disease than a disease *per se*.

There are three distinct forms of chronic pharyngitis :

1. General or diffuse pharyngitis.
2. Follicular, granular or hypertrophic pharyngitis.
3. Atrophic pharyngitis or pharyngitis sicca.

(1) General or Diffuse Pharyngitis.

Etiology.—Chronic general pharyngitis may result from a neglected attack of acute pharyngitis.

It also occurs as a direct result of chronic nasal obstruction, which latter may be due to hypertrophic rhinitis, to intra-nasal deformities, mucous polypi, or post-nasal adenoids. Interference with nasal respiration makes mouth breathing a necessity, and the air passing directly through the open mouth is no longer moistened, warmed, and purified before it comes into contact with the pharyngeal wall.

The use of alcohol, acting first as a direct local irritant, and, secondly, as inducing gastric disorders, is a frequent

PLATE II.



Chronic naso-pharyngeal catarrh. The pharyngeal wall is covered with tenacious dark greenish-yellow secretion, to which it firmly adheres.

cause of chronic pharyngitis; and the use of tobacco, in some cases, and the inhalation of irritating fumes and dust particles suspended in the air, affect the pharynx in a like fashion.

A large proportion of cases of chronic pharyngitis are dependent on chronic disorders of digestion, and particularly if this be accompanied by constipation and portal congestion. Rheumatism and gout are also determining factors in many cases; and the condition is more common and more persistent in a damp and variable climate, than it is in one which is mild and equable.

Symptoms.—The patient usually **complains** of a fulness in the throat, of some slight difficulty in swallowing, accompanied sometimes by pain, which varies in character and degree. There is a desire to hawk and expectorate on rising in the morning, and this often continues throughout the whole time spent in making the toilet. The constant hawking frequently induces retching, the straining of which may cause rupture of a pharyngeal venule tinging the expectoration with blood, much to the patient's alarm.

Diagnosis.—On **examination**, the mucous membrane of the pharynx will be found more or less deeply injected, individual vessels which normally are invisible stand out prominently, and their irregular course across the pharynx can readily be traced. The mucous membrane generally appears swollen and it may be partly covered with secretion, often of a tenacious character, and adherent to the surface. The palate and fauces lack muscular tone, and are somewhat insensitive, except in alcoholics, where retching is very readily excited.

Treatment.—The condition of the general health must have our first consideration, and where the pharyngitis is due to anæmia, to gout, or to rheumatism, special attention must at once be directed towards their treatment. The regulation of the bowels by the use of salines, the adminis-

tration of a chalybeate tonic, out of door exercise, with a plentiful supply of easily-digested food, are necessary; and it may be requisite to advise temporary removal to a dry, bracing climate. Anything which tends to cause local irritation, such as the use of ardent spirits, of tobacco, and of tea, unless it be freshly prepared and not too strong, must be avoided. When the pharynx is irritated by a relaxed, elongated uvula, a portion of the uvula should be removed. This, though a minor operation, should be performed carefully and in such a way as to have the raw surface after operation directed towards the pharynx, as already described. When the causes are carefully considered and removed, local treatment in the majority of cases is simple. Where there is a general congestion of the mucosa, the occasional use of a sedative steam inhalation at bedtime will give great comfort and hasten its removal. The combination of an astringent with a sedative in the form of a lozenge such as the rhatany and cocaine pastille, will give considerable comfort, and in other cases where the mucus is tenacious, a menthol, camphor or chloride of ammonium lozenge is beneficial.

The internal administration of glycerine in drachm doses repeated several times daily, and swabbing the surface with a solution of a mineral astringent, such as sulphate of copper (30 grs.— $\bar{5}$ j) at intervals, will be found useful in protracted cases. When the secretion is greatly increased and the condition tends to spread towards the nares, the use of chloride of ammonium by inhalation should be recommended. Gargles are only useful so far as they can affect the palate and fauces, for in the great majority of cases they never come into contact with the pharynx. The frequent and systematic application of astringent pigments should be avoided.

(2) Follicular Pharyngitis.

Follicular pharyngitis occurs in two distinct varieties, namely, the *Hypertrophic* and the *Exudative*.

Etiology.—The strumous diathesis may be, as has been asserted, the predisposing cause in most cases of hypertrophic pharyngitis: the rheumatic and in some cases the gouty diathesis in the exudative form. The pharyngeal hyperplasiæ may be associated with hypertrophy of the tonsils and other glandular structures in the neighbourhood.

The exciting causes, or at least causes which aggravate the condition, may be put shortly as over-use or improper use of the voice, and excessive use of tobacco, especially in cigarette form.

On account of the former, granular pharynx is sometimes spoken of as **clergyman's sore throat**.

Symptoms.—It is a **very chronic** condition, and has usually been present for a lengthened period before advice is sought. In the earlier stages no pain is complained of, but a feeling of stiffness and dryness is felt, and after prolonged use of the voice there is an aching soreness which affects the whole of the back of the throat, and sometimes extends towards the ears. Later it is found that the voice becomes readily exhausted, the patient gradually finds that he requires to put forth more effort than formerly in reading aloud, preaching, or singing, and sooner or later there is a distinct loss of tone in the singing voice. Attacks of huskiness supervene, necessitating frequent coughing to render the voice clear. There is little tendency for the disease to spread by contiguity to the larynx, though the follicles of the mucous membrane of the larynx may become similarly affected and particularly when the pharyngeal condition is of long standing. In many cases it extends upwards to the follicles of the lining membrane of the pharyngo-

nasal space, when deafness and noises in the ears may be complained of.

It must ever be remembered in connection with the symptoms of chronic pharyngitis, that the discomfort or distress experienced or complained of by the patient is not always proportionate with visible deviations from the normal.

In some cases there may be well-marked changes on the pharyngeal wall and the patient unaware of the presence of any abnormality, while in others the patient may complain of serious discomfort and, it may be, sharp pain, while the local changes appear insignificant.

Diagnosis—The **hypertrophic form** invariably begins on the posterior wall of the buccal pharynx. When the case is examined at a comparatively early stage, several small, smooth, rounded elevations, referred to as granules, each about the size of a pin's head, are seen dotted over this surface, and isolated from each other. On closer inspection small vessels are noticed running towards and into separate granules from various directions, forming a network of arterioles, each set leading to a hypertrophied follicle. If the condition be more advanced the granulations are more numerous, the individual ones are larger, and here and there it will be found that two or more have coalesced, to form a large flat elevation of irregular outline. These granules are red in colour, and the mucous membrane around them sometimes appears unduly pale by contrast. The morbid changes affect the epithelium, the lymph follicles and the peri-glandular tissue. On account of the presence of those numerous prominences distributed over the surface of the pharynx the condition is frequently spoken of as *granular pharyngitis*.

In some cases the changes observed as resulting from the hypertrophic process are chiefly in the lateral wall of the pharynx, in which case a line of prominent fleshy granulation-like tissue is seen filling the space between the posterior

pillar and the posterior wall of the pharynx. The red structures here consist mainly of hypertrophied lymphoid tissue: and the condition is often described as *pharyngitis hypoplastica lateralis*.

Occasionally, and especially in people who are careless of their comfort, the whole of the posterior wall of the pharynx may be covered by a thick layer of muco-purulent secretion, usually the result of a chronic naso-pharyngeal catarrh. This is apt to be mistaken for discharge covering an ulcerated surface, but that this is not the case may at once be demonstrated by the removal of the secretion with a cotton swab or otherwise.

The **exudative form** is frequently associated with follicular tonsillitis, and occurs most usually in those with rheumatic tendencies. The normal secretion of the pharyngeal follicles is clear and watery, but when they become acutely inflamed, it becomes, like the secretion of the tonsillar follicles under similar conditions, opaque and milky in appearance. When the inflammation is of a more chronic character the secretion becomes semi-solid and curd-like, and may be retained within the follicles, from which it is readily expelled by pressure. These spots are found more frequently on the lateral walls than on the posterior wall. On careful inspection each spot is found to mark the orifice of an individual follicle, the walls of which are swollen from inflammation, or, in some cases, from actual hypertrophy. As the condition progresses, the follicles become atrophied from degenerative changes in the secreting tissues of the inflamed and hypertrophied glandulæ, and this process is accompanied by an atrophy of the submucous tissue generally, by which the pharyngeal cavity may become considerably increased in size.

These small spots of retained secretions are apt to be confused with the greyish warty excrescences met with in *pharyngomycosis*: but the readiness with which the secretion

in the former case can be removed serves to dissipate all doubt in the diagnosis.

Prognosis.—Both forms of follicular pharyngitis are very chronic in character, and cases of exudative pharyngitis are perhaps more difficult of cure than those of the hypertrophic variety. Both conditions are especially troublesome when affecting public speakers and singers, and in such the vocal apparatus is very apt to be permanently impaired.

Treatment.—In both varieties of follicular pharyngitis, treatment, to be permanently effective, must be constitutional as well as local.

(a) **Constitutional.**—In the exudative form, any gouty or rheumatic tendency must be subdued by the use of appropriate remedies, colchicum, salts of lithia, alkalies, or the salicylates. Where the voice has become impaired, and the general health has suffered, a short stay at Harrogate, Strathpeffer, Ems, or Aix-les-Bains, to mention some only of many suitable resorts, will, by the rest, change of scene, and use of appropriate mineral waters, do much good.

In the hypertrophic form, and particularly where it is associated with other glandular swellings, cod liver oil, iron in an astringent form, or the syrup of the iodide of iron, should be prescribed.

In every case where there is any known exciting cause, it should be removed, and where there has been faulty use of the voice, this should be corrected.

(b) **Local.**—Many methods of local treatment have been recommended. In the earlier stages of the hypertrophic form, and while the patient's general health is being improved by constitutional treatment, the pharyngeal wall may, every second or third day, be brushed with glycerine of tannic acid, with a solution of sulphate of copper or perchloride of iron, or with ethereal tincture of iodine, from any of which much benefit may be derived. Camphor-thymol (a fluid preparation got by rubbing together the two substances in

equal proportions in a mortar) is said by some to be of considerable service.

When, however, as the patient's health improves, no marked local improvement is observed, the further use of these astringents should be discontinued, as under such circumstances the relief obtained from them will be but temporary, and, in many cases serious harm results from their indiscriminate and prolonged use. In such cases, and in cases of long standing, where the granules are prominent, a cure can only be effected by the destruction of each separate hypertrophied gland. For this purpose nitrate of silver, chromic acid, or sulphate of iron, fused on the point of a platinum probe, by which the substance employed can be accurately applied to each individual granular point, may be employed, but the results obtained are not encouraging. Morell Mackenzie recommended London paste very strongly. The results obtained from its use are good, the nodules are effectively destroyed; but its application is followed by much pain, and there is often difficulty in limiting its action to the hypertrophied spots. Dr. Carl Michel, in 1873, advocated the use of the galvano-cautery for the destruction of the hypertrophied follicles, and, following his practice, Dr. David Foulis, of Glasgow, had recourse to the actual cautery for the same purpose, and with excellent results. Now, the electric-cautery is almost universally employed, as, with cocaine, its application is rendered perfectly painless.

In using the electric-cautery, the surface of the pharynx is first anæsthetised with cocaine, then each individual prominence should be thoroughly destroyed by the slow gentle pressure of a flat burner, the platinum portion of which is kept at a dull red heat. In addition to this, it is well to destroy the small vessels, which lead up to the various spots, by a very light touch of the cautery, and thereby cut off a great part of the blood-supply going to the hypertrophied area. Following such an operation the cauterised surface

may be soothed and kept moist by the use of marsh-mallow lozenges; and for two days after the cauterisation the patient should be kept on light diet.

Within 24 hours a patch of fibrinous exudate forms on the cauterised surface. This separates in about a week, and when it is shed it leaves a clean healing surface.

In the **exudative form** the affected gland-tissue may be destroyed in the same way, or the retained secretion may be removed from the follicles by the use of a pharyngeal curette or a sharp ear-spoon, with which the interior can be well scraped. After being cleaned out, the interior of each follicle so treated may be lightly cauterised with a very fine, sharp, platinum point. In place of the galvano-cautery, strong tincture of iodine, carbolic acid, or solid nitrate of silver, may be tried, as they are recommended by some authorities; and the after-treatment necessary, is the same as when the cautery is employed for the destruction of granulations.

The hypertrophied gland tissue in *pharyngitis hyperplastica lateralis* may be removed with the galvano-cautery, or it may be clipped away with scissors. Whichever method is employed, the tissue should be removed piece-meal at two or three sittings, and care must be taken to avoid injury to the free border of the palato-pharyngeus muscle. Considerable pain may follow this operation, and when it does occur, it may be relieved by the use of cocaine lozenges.

(3) Atrophic Pharyngitis or Pharyngitis Sicca.

Etiology.—It is questionable if this form of chronic pharyngitis is in any way or at any stage associated with an inflammation of the mucous membrane.

The irritability consequent on the dryness of its surface is a constant source of annoyance to the sufferer, but evidences of any inflammatory process are entirely absent.

Nasal obstruction from various causes, as pointed out by Dr. Greville MacDonald, is a frequent cause, and we meet with it in a more or less marked degree in those suffering from chronic atrophic rhinitis. It is met with in anæmic women, and especially amongst those who imbibe quantities of long-infused or stewed tea, and those employed in a hot dusty atmosphere.

Symptoms.—The chief symptom is a constant dryness of the throat. It may be accompanied by a sense of burning or of itching in the throat, but the dry feeling which interferes with the swallowing of solid food, unless the surfaces be first moistened, is the one outstanding and constant complaint made by the patient. When associated with an atrophic rhinitis there is a varying degree of fetor of the breath.

Diagnosis.—On examination the mucous membrane appears thinned, the surface is smooth, glazed, and dry. On looking downwards it may be noticed that about the level of the dorsum of the tongue there is a line of demarcation running across the pharyngeal wall, above which the mucous membrane is dry and glazed as described, and below which it is moist, and in other respects normal in appearance. This line is produced by the moist tongue coming in contact with the pharyngeal wall during the act of deglutition. If during examination the patient retches from irritation of the fauces, the pharyngeal mucous membrane “crinkles,” when its dry, stiff character is readily appreciated by the observer. In cases of long standing we frequently find crusts of secretion firmly adherent to the surface of the dry mucous membrane, resembling somewhat the smaller crusts of rupia, though sometimes they are darker in colour from impurities introduced along with the air inspired.

Prognosis.—In this condition there is a marked pathological alteration in the structures of the pharynx, affecting at different stages the surface membrane, the submucosa,

and the gland-elements. Prognosis as to palliation or cure will depend on the extent of the changes in the tissues involved, and only in the early stages can much permanent improvement be hoped for. But though a cure may not be possible in all, much may be done to modify the discomfort, even in advanced cases.

Treatment.—In its treatment general tonics are required in most cases, and it is necessary where any obstruction to nasal respiration exists that that function should be freely re-established. Locally the best results are obtained from the use of stimulating applications. Of the many medicaments of this nature which may be employed, a combination of camphor and thymol in equal parts, which, when rubbed well together form a liquid, and menthol in olive oil in the proportion of 1 to 4, may be recommended. These when employed should be thoroughly rubbed over the affected surface with a swab. In place of the swab, the fluid selected may be applied by means of a spray-producer, the simplest form of which is the naso-pharyngeal atomiser of Messrs. Burroughs, Wellcome & Co. The desired material should be dissolved in paroline (a fluid-fatty base obtained by the fractional distillation of petroleum) in preference to olive or other vegetable oil, as paroline has a constant and comparatively low specific gravity, it does not become rancid, it is a ready solvent for volatile hydrocarbons like menthol, thymol, etc., it is free from taste and odour, and is, withal, an oily fluid. This latter is of great importance if for nothing else than for the comfort, always appreciated by the patient, imparted to the surface by an oily application. Of the substances which may be used with the atomiser the following, and in the proportions given, may be noted:—Pinol, one part dissolved in nine of paroline, and thymol of the same strength; menthol, terebene, and camphor employed separately, and each solution containing one part of the active ingredient to four parts of

paroleine. Similar applications may readily be made to the interior of the nose when the nasal lining membrane is affected.

The object of these applications is to induce hyperæmia of the surface, and thereby to stimulate secretion. The result is usually an increase in the quantity of the secretion, which becomes more watery in character, and thus the pharyngeal surface is rendered moist, soft and flexible.

To the same end ipecacuanha is employed by some, and in the form of lozenge it is readily given with, in some cases, satisfactory results.

When the secretion becomes crusted it may be removed by the use of alkaline solutions, or by the swabbing of the surfaces with solution of hydrogen peroxide.

CHAPTER IV.

AFFECTIONS OF THE UVULA.

WHILE the uvula may be affected by various disease-processes in connection with, and usually as a result of extension from, the palate and fauces, yet it is occasionally alone affected.



FIG. 16.—Normal uvula.

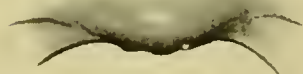


FIG. 17.—Absence of the uvula, the result of ulceration.

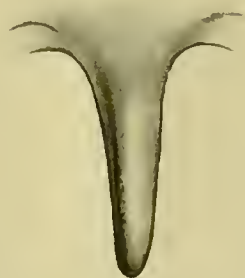


FIG. 18.—Elongation of the uvula.

BIFID UVULA.

Reference has already been made to the bifid uvula, where the cleft, which bisects it, may affect the tip alone, or may extend upwards to its base and so completely divides it throughout its length as to form two uvulas.

This abnormality may give rise to no local discomfort, or at most it may create slight faucial irritation only.

ELONGATION OF THE UVULA.

The uvula may be long and tapering, a condition which may be due to atony of the muscular tissue, and which may result from

several different causes, amongst which are dyspepsia, anæmia, and chronic faucitis.

The **symptoms** which are associated with elongation of the uvula may be trivial or non-existent; at other times they take the form of a persistent local irritation. The patient may have a constant desire to clear the throat, and have a frequent tickling cough: sometimes the elongated uvula induces retching; and in these cases where the uvula is so greatly increased in size that the tip reaches to the larynx, spasm of the glottis, particularly during sleep, may be excited.

Diagnosis.—It has already been pointed out that elongation of the uvula may be overlooked, particularly if the parts are examined hastily. When the mouth is opened and the patient inhales deeply, the uvula is drawn upwards, but after a few seconds, if the patient continues to breathe quietly with the mouth open, the muscular contraction which caused the shortening becomes spent, and the uvula descends, when its abnormal condition is readily recognised.

Treatment.—When the use of astringents, as described under treatment for relaxed sore throat, has failed to restore the uvula to its normal state, a portion of it should be removed. Complete removal is advised by some authorities, but the removal of a portion only is to be preferred. The operation may be



FIG. 19. — Contraction which may take place even in a case of elongated uvula during deep inspiration.



FIG. 20.—Bifid uvula.



FIG. 21.—Hypertrophy of the uvula.

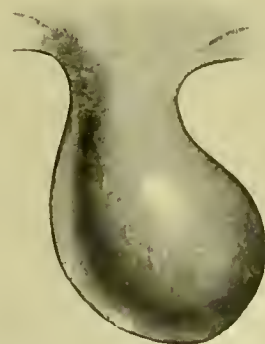


FIG. 22.—Edema of the uvula.

performed by means of a uvulatome, similar in principle to the tonsillotome; with a bistoury; with scissors curved on the flat; or with Lennox Browne's uvula scissors. In performing this small operation, the surface of the

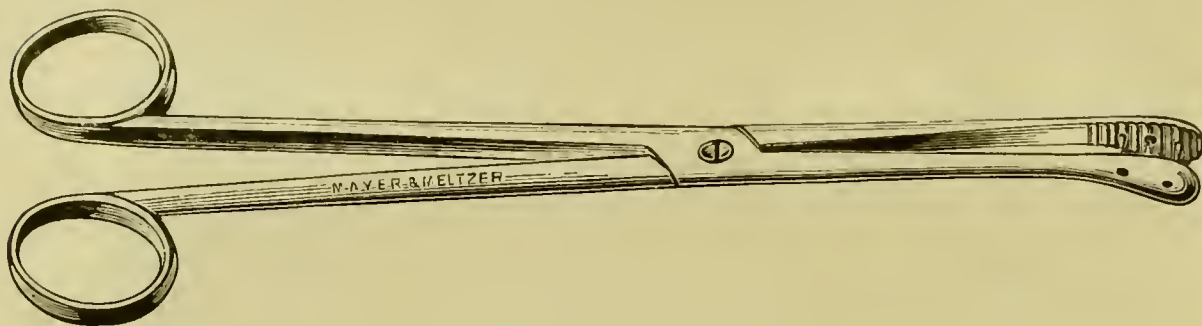


FIG. 23.—Lennox Browne's uvula forceps.

uvula and the free border of the soft palate are first anæsthetised with cocaine. This is most satisfactorily accomplished by means of a cotton-wool swab dipped in a 10% or 15% solution of the hydrochlorate of cocaine, with which the surface of the soft palate and the uvula is firmly rubbed. When sensation has been abolished, the

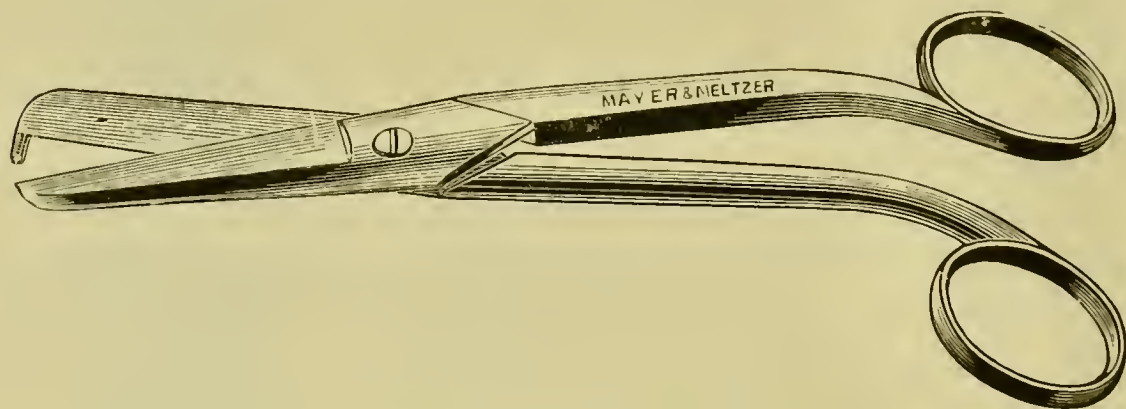


FIG. 24.—Lennox Browne's uvula scissors.

elongated uvula is grasped near its extremity with a pair of self-locking dressing forceps, by which it is pulled downwards and somewhat forwards, and so kept on the stretch. The lower portion is then cut away, leaving a part about one-third of an inch in length. If scissors be used the incision is made from before, backwards, and upwards, and if a bistoury is employed, the cut is made from behind the

uvula, and is directed forwards and downwards, the object being to have the resulting raw surface directed towards the pharyngeal wall. When it is cut in this manner, the raw surface is protected from irritation during deglutition. If on the other hand it be cut straight across, either by accident or through inexperience, the whole of the lower surface is raw, the covering mucosa retracts and exposes the muscular tissue, with the result that everything which the patient attempts to swallow frets the surface, causes much pain, and interferes with the healing process.

Hot and spiced foods should be avoided while the parts are healing, and during the first twenty-four hours, milk preparations are most suitable. A weak antiseptic mouth wash, and demulcent lozenges, such as marsh-mallow, add to the patient's comfort, and, where much pain is complained of, it may readily be relieved by the use of a cocaine or morphia lozenge. Hæmorrhage, either primary or secondary, after amputation of the uvula, is exceedingly rare, and where it does occur the bleeding vessel may be readily picked up with artery forceps and ligatured.

HYPERTROPHY OF THE UVULA.

Hypertrophy of the uvula is seen in cases of chronic faucitis, and where the uvula is chiefly affected the cause may be found in the smoking of tobacco to excess.

Symptoms.—An hypertrophied uvula may excite a feeling of dryness in the throat, may cause paroxysmal cough, or give rise to a feeling of something lodged in the throat.

Diagnosis.—While the uvula, when hypertrophied, may be considerably increased in size, it may either retain its usual form, or become bulbous. It is firm and fleshy and less flexible than the normal uvula.

Treatment.—Where it gives rise to symptoms which are not relieved by the application of astringents, such as

glycerine of iron, or a solution of nitrate of silver, and the avoidance of anything which may lead to a chronic congestion, relief may be obtained by the removal of a portion of the uvula.

ŒDEMA OF THE UVULA.

This is elsewhere referred to as a complication of acute inflammation of the tonsils or of the neighbouring structures. But some individuals are prone to the appearance of œdema of the uvula on exposure to cold winds, and on taking certain forms of exercise in the open air.

Symptoms.—When œdema appears suddenly, there may be excitement of the faucil and pharyngeal reflexes, which may cause coughing or retching; and in cases where there is a considerable degree of œdema, difficulty of breathing may be experienced.

Diagnosis.—The appearance of the uvula when œdematous is quite characteristic. It is enlarged, often greatly so, and, while its surface may be red or pale, the whole uvula appears more or less translucent.

Treatment.—The swelling due to œdema may be relieved by pricking the surface of the uvula with a sharp needle, by making a series of superficial incisions into it, or by cutting off the most dependent portion. Whatever procedure is adopted it should be followed by the sipping of a warm, weak solution of boracic acid at frequent intervals.

ANGEIOMA OF THE UVULA.

A venous nævus is occasionally seen in the palate, and it may extend to and involve the uvula. Plate III. depicts a case where there was this form of cavernous nævus of the palate, the blue colouration of which is well shown. But in this case there was in addition, very considerable enlargement of the uvula, and it had become to all intents and



Venous angioma of the uvula.



purposes a venous angeioma. While it was greatly enlarged, soft and flabby, it had given the patient comparatively little trouble, but as he was going abroad he desired to have it removed. This I did by first tying a ligature tightly around its base, and then clipping off the portion of the uvula below that level with scissors. No blood was lost at the operation or subsequently.

EPITHELIOMA OF THE UVULA.

Primary epithelioma of the uvula is a rare lesion. Where it does occur it is in people well over fifty, and the new growth and accompanying ulceration can usually be readily recognised as malignant.

I have seen and operated upon three cases, two occurring in men, one in July, 1897, and the other in April, 1909, as this book is passing through the press, and one in a woman in 1903.

The first case is particularly interesting as the patient's subsequent history is known to me. The patient was a blacksmith, fifty-six years of age, and when first seen on 15th July, 1897, he complained of having had soreness of the throat for two months. On being questioned, he stated that he suffered pain at the back of the throat only while swallowing, and thinking "that the pap of the husk had come down" (*i.e.* elongation of the uvula), he had gargled with a solution of alum. Pain and discomfort, however, continued to increase, and latterly it had seriously interfered with deglutition. While awake there was no interference with his respiration, but while asleep he snored loudly, and he occasionally woke up with a sense of suffocation. His voice was unaffected.

On inspection it was seen that, while the palate and fauces appeared normal, the uvula was greatly enlarged, as is shown in the drawing (Fig. 25), which is life-size. The

greater part of the surface of the uvula, anteriorly and laterally, was ulcerated, and the free end or tip, which



FIG. 25.—Primary epithelioma of the uvula in a man 56 years of age.

rested on the dorsum of the tongue, was also raw. The only part on which the mucous membrane was intact

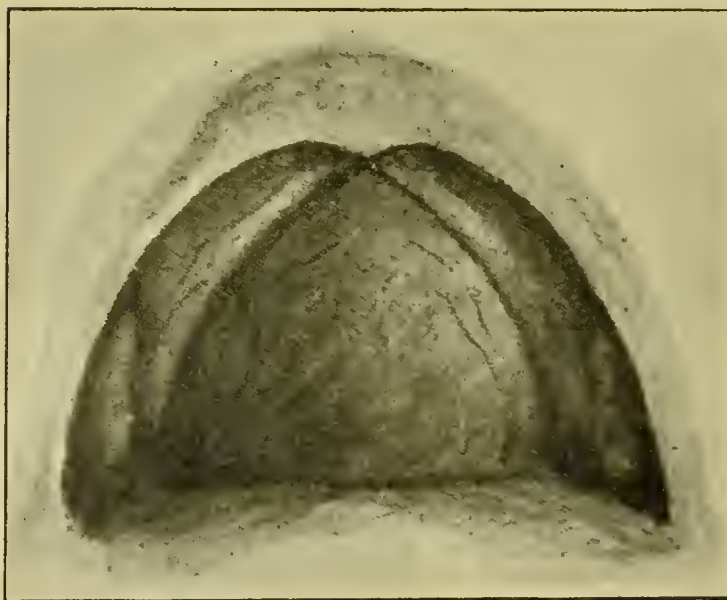


FIG. 26.—Fauces and palate of case, Fig. 25, taken fourteen months after removal of the epithelioma of the uvula.

formed a strip which extended from the base some distance downwards on the left side, and the edges of this area were elevated and irregular. This bulky, ulcerated mass

was found to be hard and firm on palpation, and slight manipulation caused the surface to bleed.

No implication of the neighbouring lymphatics, nor enlargement of the cervical glands could be detected. Epithelioma of the uvula was the diagnosis, and the whole appendage was excised on the following day. The soft palate and faucial pillars were anaesthetised with cocaine, and the uvula removed by means of scissors, the incisions being made into the soft palate at a considerable distance from the margins of the tumour. In a few days the surfaces were healed over. Sections of the new growth were prepared by Dr. A. R. Ferguson, Pathological Department of the Western Infirmary, and these confirmed the diagnosis of epithelioma. The drawing (Fig. 26) was made fourteen months after the operation.

Ten years later, February 1907, the man applied for admission to the Western Infirmary on account of a large tumour in the right posterior triangle of the neck. It was firmly incorporated with the neighbouring structures, was diagnosed to be malignant, and could not be removed (Fig. 27).

I had an opportunity of examining his throat at this time, and found the appearance of the parts to be identical with that in the drawing made fourteen months after the operation. No recurrence of the disease had taken place in the palate, the fauces, or the pharynx. A few months later he died in the Cancer Hospital.

The second case was that of a woman aged 37, in which there was at first some doubt regarding the nature of the lesion, chiefly on account of her age. After a course of the iodides, under the influence of which no improvement took place, the uvula was removed, along with a considerable margin of healthy soft palate. On microscopic examination the ulcer proved to be an epithelioma.

Four years later (May 1908), the left tonsil began to increase in size, and there was slight pain on swallowing.

When she came to the Infirmary for advice the tonsil was hard and prominent (see Plate VI.), and several cervical glands were involved.

The tumour of the tonsil proved, on examination after removal, to be a scirrhus.



FIG. 27.—Patient whose fauces are depicted in Figs. 25 and 26 ten years after operation, showing a large malignant tumour of the neck.

The third case was that of a man aged 64, who was admitted to one of the wards under my care on 15th April, 1909.

Three months previously, he had, for the first time, experienced a sensation of something sticking in the back of his throat when swallowing saliva. The swallowing of food caused no discomfort or pain until five weeks before admission, when each attempt was accompanied by sharp stinging pains, which, he said, shot along both sides of the jaw to the tempero-maxillary articulations.

On examination the uvula was seen to have lost its normal shape, and had become a thick flattened structure about the size of a shilling, the whole anterior surface of which was ulcerated and granular. On palpation it was found to be hard and to bleed readily.



FIG. 28.—Primary epithelioma of the uvula in a man 64 years of age.

There was no dubiety regarding the diagnosis. The palate was anæsthetised by the subcutaneous injection of cocaine and adrenalin, and the new growth was removed with curved scissors, the incisions being made as far from the margin of the new growth as was possible.

Sections of the tumour were made and examined by Dr. Teacher at the Pathological Department of the Western Infirmary, who reported that the growth was a typical epithelioma.

CHAPTER V.

THRUSH, LEPTOTHRIX, AND KERATOSIS.

THRUSH OR APHTHÆ.

THRUSH is a popular inclusive name applied to aphthous ulcers as well as to stomatitis, both of which conditions usually make their appearance on the tongue or buccal mucosa, from which they may spread to the fauces and pharynx.

Etiology.—Aphthous ulcers are due to the presence of the *oidium albicans*, a vegetable parasite which is now recognised to be identical with the *oidium lactis*, on the presence of which the acid fermentation of milk depends. The term **apthæ** should properly be confined to those cases in which the *oidium albicans* occurs, while **thrush** may be used to embrace a variety of simple ulcerative lesions, dependent on buccal, gastric, or intestinal irritation.

Symptoms.—Thrush is chiefly met with in hand-fed infants, and in adults far spent with phthisis or other wasting disease. The sores are painful, there is increased secretion and salivation, and their presence is frequently associated with gastro-intestinal disturbance, diarrhœa and vomiting.

Diagnosis.—The ulcers are at first small and few in number. Each is covered with a white flake of exudation, surrounded by a thin line of inflammation, and, if the exudate

be shed, the ulcer is found to be well defined, with an inflamed base. As they spread, neighbouring ulcers coalesce to form larger sores.

Treatment.—Great attention must be paid to the feeding of the patient, and to the cleansing of the mouth with alkaline solutions. Frequent painting of the surfaces with solution of sulphite of soda ($\frac{3i}{j}$ to $\frac{5i}{j}$ of water), or with solution of sulphurous acid ($\frac{3ij}{j}$ to $\frac{5i}{j}$), is of great service, and when ulcers have formed, the application of a solution of nitrate of silver (30 gr. to $\frac{5j}{j}$) relieves the pain and stimulates healing.

LEPTOTHRIX.

The *leptothricia buccalis* is the active agent in *mycosis leptothricia*. This fungus is usually present in the secretions of the mouth, but healthy mucosa is unfavourable to its development. When the conditions are favourable to its growth, it may lead to the formation of white patches on any part of the faucial or pharyngeal mucosa. Where the tonsil is implicated, the result is spoken of as *mycosis tonsillaris*, and in the case of the pharynx as *pharyngo-mycosis*, both of which conditions have until lately been confused with keratosis of the tonsil and pharynx.

Treatment.—The patches of leptothrix may be readily removed, and the surfaces successfully treated with antiseptic applications.

KERATOSIS OF THE TONSILS AND PHARYNX.

Keratosis of the tonsils and pharynx consists of localised cornification of the epithelial cells. The surface of the resulting outgrowth is less dense than the central part, and amongst the more loosely packed cells leptothrix filaments are found. For this reason this fungus was for long looked upon as the determining cause of the outgrowth, but

Siebenmann in 1895 demonstrated, by careful microscopical investigations, that the fundamental pathological condition is a cornification of the epithelium lining the tonsillar crypts, and he proposed that the condition be termed *hyperkeratosis lacunaris*.

Etiology.—Nothing definite has been discovered on this point, but, whatever the cause, the condition does not appear to depend on a mycosis. Keratosis is occasionally met with in those who have chronic follicular tonsillitis, but the causative association between the two has not been proved.

Symptoms.—In most cases there is an absence of symptoms, and the condition is usually discovered accidentally. Occasionally there is a complaint of irritation in the throat, leading to a short cough, or desire to clear the throat.

Diagnosis.—Numerous white spots are seen on examination. They are small, varying in size from a pin's head to a hemp seed, and isolated, they are white, tough, and prominent, are firmly adherent to the surface from which they spring, and are unaccompanied by local inflammation or constitutional disturbance. The tonsil alone may be affected, though usually the area of their distribution is greater and includes the faucial pillars, the pharynx, and the post-circumvallate area of the base of the tongue. The condition is comparatively rare, and in my experience is met with more frequently amongst private than amongst hospital patients. On account of its rarity, the white patches associated with the condition are frequently mistaken either for the secretion of acute follicular tonsillitis or for the local manifestation of diphtheria. Some years ago I showed two cases at the Glasgow Medico-Chirurgical Society. One was a man, aged 53, who had been sent to hospital as suffering from diphtheria, and the other as a case of follicular tonsillitis.

In keratosis there is entire absence of inflammation of the fauces or pharynx: the lymphatic glands are unaffected, and there is no rise in temperature. The growth is of a firm fibrous character, firmly incorporated with the mucous membrane from which it springs, and from which there is difficulty in removing it. In this respect this new growth stands out in marked contrast to the soft pultaceous character of the secretion in follicular tonsillitis.

As time goes on, the obstinate character of the condition becomes its leading feature, and the thought of follicular tonsillitis and the fear of diphtheria are put aside without hesitation.

Treatment.—Occasionally the condition disappears as mysteriously as it made its appearance. The symptoms are, as has been said, usually trivial, and as the condition is one which leads to no serious result the patient should in every case be assured of this fact. Still it is an abnormality, and the presence of the patches are apt to worry the patient. Antiseptic and caustic applications are of no service in the removal of the new growths. More active measures are required. Each individual outgrowth should be thoroughly destroyed with the electric cautery, several of the outgrowths being treated at each sitting. Where the affected tonsil is enlarged it should be excised, and any excrescences remaining in the crypts of the stump of the tonsil, on the pillars, pharynx, or tongue, should be destroyed with the electric cautery.

CHAPTER VI.

ACUTE INFLAMMATIONS OF THE TONSILS.

I. ACUTE TONSILLITIS. ACUTE INFLAMMATION OF THE FAUCIAL TONSILS.

ACUTE inflammations of the tonsils are, for purposes of description, and according to the nature and severity of the process, divided into the following varieties.

(1) **Acute Superficial Tonsillitis**, in which the mucous membrane is alone involved. It is tonsillitis in its simplest form, and it occurs as part of an acute inflammation affecting alike the mucosa of the fauces and the pharynx.

(2) **Acute Follicular or Lacunar Tonsillitis**.—The inflammatory process in this form specially affects, and may be confined to, the crypts or follicles of the tonsil.

(3) **Acute Parenchymatous Tonsillitis**, in which the inflammation affects the tonsil-tissue proper, a condition which is prone to terminate in abscess formation.

(4) **Acute Peritonsillitis**.—During the course of an acute parenchymatous tonsillitis the loose connective tissue around the tonsil is frequently infected and becomes involved in the suppurative process.

(5) **Acute Ulcerative Tonsillitis** is a somewhat rare acute septic lesion, characterised by ulceration of the covering mucosa.

General Etiology.—The causes which lead up to an attack of acute tonsillitis are conveniently divided into predisposing and exciting.

Predisposing causes.—Acute tonsillitis in its various forms is a disease of early adult life, so age is a predisposing cause. One attack predisposes the individual to subsequent attacks, and depressed health resulting from badly ventilated work-rooms, insanitary surroundings, or actual illness may be the predisposing cause. Those who have hypertrophied tonsils are specially prone to attacks of acute inflammation. Acute follicular tonsillitis is considered by many to be a manifestation of the rheumatic diathesis, and an acute lacunar tonsillitis may alternate with, or may precede, an attack of acute rheumatism.

Exciting causes.—Infection of the tonsil by septic micro-organisms is *the* exciting cause. The infection is usually of a mixed character, but in some cases pure cultures of the *streptococcus pyogenes*, of *staphylococci*, of *pneumococci*, and of *diplococci* have been obtained.

A patient suffering from acute parenchymatous tonsillitis usually dates his illness from an exposure to cold and wet. This may be the immediate cause of the attack, since it lowers the patient's resisting power to the entrance of septic micro-organisms which, even in health, may be found lurking in the crypts of the tonsils.

In acute follicular tonsillitis both tonsils are invariably involved, a fact which points to the tonsillar affection being a manifestation of a constitutional infection.

In acute parenchymatous tonsillitis and in acute peritonsillitis, on the other hand, usually one side alone is involved at a time. In these two instances the inflammation is of a very acute localised character, and if left untreated will almost certainly end in the formation of pus, a clear indication that in both conditions the process is due to a local septic cause.

Symptoms and Appearances on Examination.

(1) In **acute superficial tonsillitis** the patient usually complains of discomfort in the throat, with a sense of irritation, and sometimes slight pain, which is referred to the neighbourhood of the tonsil, and may extend up to the ear.

On examination the fauces and the tonsils are seen to be uniformly red, and the latter may be moderately swollen.

(2) In **acute follicular tonsillitis** the patient complains of headache and pains in the limbs. Speech may be thick and there may be pain on swallowing, but neither respiration nor deglutition are seriously affected. The temperature quickly rises to any point between 102° F. and 104° F. or even higher, and this marked elevation is not usually accompanied by the prostration which one associates with such a temperature.

On examination both tonsils are seen to be affected. They are somewhat enlarged, and over the surface of each there are several greyish-white patches. If the patches be carefully examined it will be found that each patch or spot corresponds with the mouth of a follicle, and the greyish-white material consists of lacunar secretion, epithelial *débris*, leucocytes, and micro-organisms.

Where the secretion is abundant, that from neighbouring follicles may join to form a larger patch. The patch so formed can readily be wiped off, and the surface beneath will be found to be unaffected.

(3) In **acute parenchymatous tonsillitis** (often spoken of as **quinsy**) it is rare to have both tonsils affected at the same time, and in those cases where the second tonsil becomes affected, this usually occurs as the one first inflamed is nearly well. Acute parenchymatous tonsillitis is usually ushered in with a rigor, followed by febrile disturbance and general malaise.

The inflamed tonsil swells rapidly and is deeply injected,



From a patient with hypertrophied tonsils who was subject to attacks of acute follicular tonsillitis. An attack is passing away, the right tonsil is still inflamed, and some secretion remains in several of the follicles.



sometimes even to lividity, and those evidences of inflammation are not confined to the tonsil, but involve the faucial pillars on the affected side, and the soft palate immediately over the inflamed tonsil.

Deglutition is painful and difficult, sometimes impossible, and during the act sharp pains shoot up towards the ear. Occasionally when fluids are being swallowed, a portion returns by the nose, as, from the swelling of the tonsil and surrounding structures, the naso-pharynx is not completely shut off from the buccal cavity, as it should be, during the act of deglutition. The pain is often so great that the patient prefers to do without food rather than suffer the agony of swallowing it, and for the same reason the salivary secretion, which is increased in quantity, is allowed to dribble from the mouth, and when the patient sleeps, it forms a pool on the pillow close to the angle of his mouth.

On account of the swelling, respiration is impeded: the patient breathes noisily when awake and snores when asleep.

His speech is characteristic; it is thick and nasal, and articulation is imperfect.

By extension of the inflammatory swelling, the Eustachian tube may become involved, leading to impairment of hearing.

The temperature is raised, but rarely does it rise to the height which is so frequently met with in cases of acute follicular tonsillitis, and yet the patient suffers much greater distress.

On examining the patient the first difficulty is met with when he is asked to open his mouth. This he has great difficulty in doing, and sometimes it is impossible for him to separate the lower teeth from the upper set on account of the inflammatory swelling of the parts around the tonsil and in the neighbourhood of the condyle of the jaw.

When the mouth can be opened the tongue is seen to be thickly coated with cream-coloured "fur," and the odour of the breath is offensive.

The inflamed tonsil may become so increased in size as to occupy one-half or more of the faucial isthmus; it may bulge towards the mouth, and its lower border may rest on the base of the tongue. It is bright red or livid in colour, and in the later stage there is bogginess of the mucosa, and œdema of the uvula. The latter may be pushed to one side and be so increased in size as to apparently fill up the remaining free space of the isthmus of the fauces.

The inflamed tonsil, which forms a uniform rounded swelling, is in the early stage firm and hard to the touch. At a later stage fluctuation may be detected at some part of the tonsil, or it may, as in peritonsillitis, be above or around the inflamed gland.

Where the second tonsil becomes affected, it usually begins to swell and become painful as the inflammation of the one first affected is subsiding; and the implication of the second one is marked by a rigor and rise of temperature similar to that which preceded the first attack. It runs a similar course, ending in resolution, in abscess, or in permanent enlargement of the tonsil.

(4) **Acute Peritonsillitis.**—During the course of an acute parenchymatous tonsillitis the loose connective tissue around the tonsil is frequently infected, and becomes involved in the suppurative process. But, apart from this, the peritonsillar tissue may be directly infected through the supratonsillar fossa.

In the first instance, the peritonsillar inflammation aggravates the symptoms dependent on the tonsillar inflammation; and in the latter instance, which is a rare occurrence, the symptoms are somewhat similar, but there is practically no enlargement of the tonsil. The swelling is above and outside the tonsil, and the affected part of the soft palate is red, bulges towards the mouth, and is accompanied by œdema of the uvula. The inflammation may extend to, and lead to abscess-formation in, the naso-pharynx.

The tongue is furred, the patient has difficulty in opening his mouth, and the cervical glands on the affected side may become enlarged.

(5) **Acute Ulcerative Tonsillitis** is now rarely seen. It is largely dependent (*a*) on a depressed state of the patient's health, and (*b*) on badly insanitary surroundings. It was known in former times as Hospital Sore Throat. While there may be one or more ulcers, varying considerably in size, the surface of each covered by a yellow grey slough, and each surrounded by an areola of inflammation, the tonsil as a whole is neither highly inflamed nor necessarily much enlarged.

The patient bears evidence of general enfeeblement, and is usually in an anæmic condition.

Diagnosis.—*Acute Superficial Tonsillitis*, in which the surface of the tonsils and fauces is red and slightly swollen, may be confused with scarlatinal sore throat.

In the latter the injection of the mucosa is deeper in colour and is more widespread than in the catarrhal tonsillitis; there is elevation of temperature in the case of scarlet fever, which is for the most part absent in the former, and if the skin be carefully examined any doubt is usually at once dispelled.

In *Acute Follicular Tonsillitis* the spots are sometimes mistaken for ulcers, though here there is no breach of surface; and in cases where the spots are few in number or the secretion copious and spread over the tonsils, this form of tonsillitis may be mistaken for diphtheria. And at times even the most experienced observer may have difficulty in distinguishing between them. It is very essential that the diagnosis be made at as early a stage as is possible, for while the one is a comparatively simple ailment, the other is a serious disease, which in former times led to a fatal issue in a large proportion of cases; and the treatment of the two conditions is wholly different.

The chief clinical points in which they differ, and by which they may be distinguished, may be put shortly thus:

ACUTE FOLLICULAR TONSILLITIS.

The **temperature** is usually high, varying from 100° F. to 104° F.

Usually there are **several patches** in Acute Follicular Tonsillitis. There is thus *safety in numbers*.

Both tonsils are simultaneously affected, though it may be unequally; the individual spots are usually isolated, and each spot corresponds with the opening of a follicle, and the spots are confined to the tonsils.

Sometimes the secretion exudes from the mouths of the crypts, and, coming in contact with that from neighbouring follicles, covers a considerable part of the surface of the tonsil. It is soft and friable, there is no continuous membrane, as can be shown by passing a probe through it between any two given follicles; and this patch can readily be removed by a brush or cotton swab without leaving any abrasion of the surface beneath.

It is exceptional to have enlargement of the cervical glands from an Acute Follicular Tonsillitis.

The presence or absence of albumen in the urine will aid in determining the diagnosis, and further confirmatory evidence of the difference between the secretion in the one case, and the exudation in the other, will be obtained by

DIPHTHERIA.

In the early stage of Diphtheria, at which stage differentiation is of most importance, the **temperature** is rarely raised by more than 1° F.

Usually there is **one patch** only in Diphtheria.

The patch in Diphtheria has no special relationship to the follicles, and it is not necessarily limited to the tonsil, but it readily spreads on to the faucial pillars, to the uvula and the palate.

The patch in Diphtheria is an exudation, is tough and in intimate union with the underlying mucosa; and, if it be removed, the mucous membrane is removed with it, and a bleeding surface remains.

In Diphtheria the cervical glands are frequently involved at an early stage of the disease.

resort to the bacteriological and cultural methods of examination.

Prognosis.—Although the symptoms associated with acute tonsillitis in its severer forms are alarming, the prognosis is almost always favourable.

In *superficial* and in *follicular tonsillitis*, resolution, under ordinary circumstances, takes place in from three to five days, and in these forms the inflammation seldom, if ever, goes on to suppuration.

In *parenchymatous tonsillitis*, and when suppuration occurs in or around the tonsil, its course is seldom much short of ten days, and occasionally three or four weeks may pass before the inflammatory process has quite subsided. When the resulting abscess ruptures spontaneously, the pus may escape by way of the supra-tonsillar fossa, or it may make its way out between the faucial pillars and the tonsil, or it may ulcerate through the soft palate. The affected tonsil after an attack of acute inflammation may remain permanently enlarged, and a liability to a recurrence of similar attacks may be established.

Treatment.—In *acute superficial tonsillitis* the treatment should be conducted on the lines laid down for the treatment of acute faucitis. An aperient should be administered early; the inflamed surface may be painted over with a solution of nitrate of silver (15 gr.— $\bar{3}$ i), or glycerine of the perchloride of iron (1 in 5); nourishment should be in the form of warm fluids, and, if there is elevation of temperature or much pain, the patient should be confined to bed and warm sedative inhalations prescribed.

In *acute follicular tonsillitis* the treatment should be similar to that adopted when dealing with a patient suffering from acute rheumatism.

Where the tongue is foul, and the bowels constipated, a sharp purge should be given at once in the form of 3 to 5 grs. of calomel or $\bar{3}$ ss– $\bar{3}$ i of castor oil. The patient should

be strictly confined to bed. Of the many drugs which may be used salicylate of sodium is the most generally useful. It may be combined with bicarbonate of soda, or, and I think better, with liquor ammoniæ acetatis, as follows :

R	Sodii Salicylatis	ʒiij.
	Liqr. Ammon. Acet.	ʒiij.
	Glycerini	ʒj.
	Aq. Cinnamoni ad	ʒvj.

Of this a dessertspoonful should be given every two hours until the patient's skin becomes moist, after which it should be given every three or four hours only. So soon as the patient begins to perspire under its influence, his temperature begins to fall, and the pains and general discomfort of which he complained disappear.

When this form occurs in those having marked rheumatic tendencies, the alkalies in full doses may be used in place of the salicylates.

If after the acute symptoms have subsided the tonsils are found to be enlarged, it is advisable to have them removed.

Acute Parenchymatous Tonsillitis is frequently associated with disordered digestion, with a thickly furred tongue, and foul-smelling breath. When this is the case much relief, both local and general, may be obtained from the use of a sharp emetic, such as a solution of salt, or ipecacuanha with zinc sulphate ; and while the local inflammation may not be reduced by this means, the general temperature is frequently lowered. (An emetic was recommended by the older practitioners in the later stages, when suppuration had occurred, as a method of evacuating the abscess.) In place of an emetic, treatment may be begun by the administration of a sharp purge, such as 3 to 5 grains of calomel, followed by a warm saline.

If the inflammatory process be in the early stage, its further progress may be stayed by swabbing the surface of

the tonsil and the interior of the supra-tonsillar fossa with a solution of hydrogen peroxide of 20 vols. strength, then after drying those parts with absorbent cotton-wool, painting the surface with a strong solution of nitrate of silver (30 gr.— \bar{z} i.). This should be followed by the almost constant sucking of ice, and the application of an ice-bag to the affected side of the neck.

Internally, aconite or guaiacum may be used, both of which have been proved by experience to have some, if not exactly a specific, action in allaying tonsillar inflammation.

Aconite in the form of tincture should be given in doses of one minim every ten minutes for an hour, then in doses of one minim every hour until the skin acts and the temperature is reduced. During its administration the patient must be strictly confined to bed, and the action of the drug on the heart carefully watched.

Tincture of aconite may also be applied locally, as recommended by Dr. Prosser James, combined with glycerine or water, and painted over the inflamed surface with a hair pencil. If the three constituents of the mixture, tincture of aconite, glycerine, and water, are in equal proportions, the quantity carried by a medium sized hair pencil will contain close on three minims of the tincture.

Guaiacum is preferred by others. It was strongly recommended by the late Sir Thomas Watson, and later and very strongly by the late Sir Morell Mackenzie, who prescribed the resin in the form of lozenge, made, according to the Pharmacopœia of the London Throat Hospital, with black-currant paste. Each lozenge contains from 2 to 3 grains of the resin, and it is recommended to take one every two hours. Should the lozenge tend to nauseate, the ammoniated tincture in doses of \bar{z} ss to \bar{z} i, or the *mistura guaiaci* B.P. in doses of \bar{z} ss to \bar{z} ii may be substituted, and in many cases the beneficial action of this drug is of a satisfactory character. It is, however, worse than useless to prescribe

guaiaicum where the tonsil is much swollen and highly inflamed.

Scarification of the surface of the inflamed tonsil, as recommended by some, is inadvisable. It adds to the patient's sufferings, may cause ulceration, and it seldom if ever affords relief.

When the inflammation is not checked in the earlier stage, it will almost certainly go on to suppuration, so that if the affected tonsil remains deeply injected, swollen, and painful beyond the second day, treatment should be directed towards encouraging and hastening the suppurative process. To this end hot fomentations or hot poultices should be applied over the neck, or, where this cannot be tolerated, the neck on the affected side should be covered with a thick pad of cotton wool. Hot moist inhalations, such as steam, alone or impregnated with some volatile sedative, such as hops, conium, or compound tincture of benzoin, should be used for three to five minutes on each occasion several times a day. The mouth should be rinsed with hot water, or with a warm watery solution of borax, boracic acid, or chlorate of potash.

The further progress of the inflammatory process is accompanied by much pain, which seriously interferes with both swallowing and with sleep. The pain may be relieved in great measure by having the inflamed surface painted over with a ten *per cent.* solution of hydrochlorate of cocaine prior to taking food; and much general comfort may be obtained from the administration of ten to fifteen grains of Dover's powder at bedtime.

A careful watch should be kept over the inflamed area in order to detect the presence of pus as early as possible. The abscess rarely forms in the tonsil, the suppuration occurs in the loose connective tissue around and above the tonsil, and the resulting abscess is in reality a peritonsillar abscess.

Pus is detected by palpation of the peri-tonsillar area, and so soon as fluctuation is made out, the abscess should be opened. This is most easily and safely accomplished by making an incision over the most prominent part of the swelling, which is usually about half an inch above, and half an inch external to the upper margin of the anterior pillar. The incision should be made with a bistoury, and in the line of the fibres of the palato-glossus muscle; it should

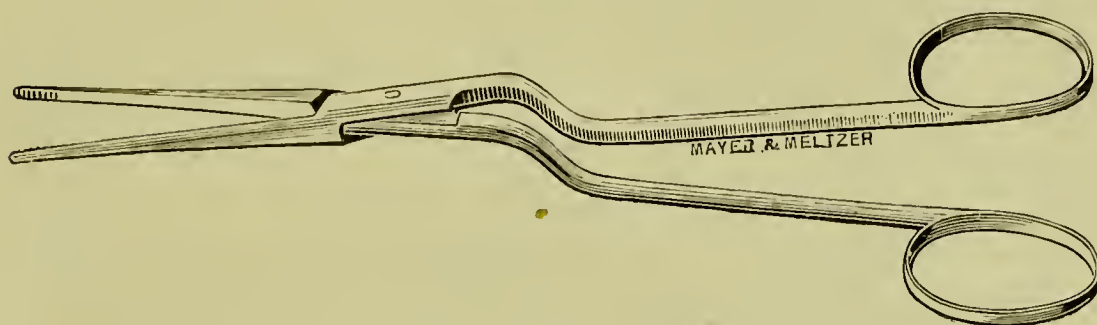


FIG. 29.—Forceps used in opening a peri-tonsillar abscess.

be fully half an inch long, and *should extend through the mucous membrane only*. A pair of sinus or dresser's forceps, or special forceps similar to the latter, but longer, and with the blades flattened towards the point, are taken, and, with the blades closed, the point is placed within the lips of the incision, then with a sudden jerk the point is forced into the abscess cavity. The blades are then quickly separated, and by the opening of the forceps the fibres of the palato-glossus muscle are separated, resulting in what amounts to a free incision through the abscess wall made without endangering any important structure. The pus, which is often under considerable tension, and is always foul-smelling, escapes freely, and the patient gets almost immediate relief. By the previous application of a 15% solution of cocaine firmly rubbed over the surface of the swelling, this operation can be accomplished with a minimum of pain. Following the operation, a warm antiseptic mouth-wash should be used by the patient frequently for a few

days, by which time the parts will have assumed their normal condition.

Complications.—An acute tonsillitis does not always terminate in the satisfactory way just described, although in the great majority of cases it does so. During the illness orchitis or ovaritis may supervene.

When the inflammatory process has been severe, and especially in weakly patients, ulceration or gangrene of a portion of the tonsil may occur.

Chronic abscess in or around the tonsil may follow, giving rise to much discomfort to the patient, and necessitating radical surgical measures for its cure.

In the bursting of a large peri-tonsillar abscess, the pus may be swallowed, or, and especially if it occurs while the patient is asleep, it may be inhaled, in which case it may cause death by suffocation; or, and more likely, it may lead to septic infection of the lungs.

In acute peri-tonsillitis the inflammation may spread to the middle ear and it may lead to an acute suppurative otitis media, and possibly mastoid necrosis; it may extend to and cause deep suppuration in the lateral walls of the pharynx, or it may lead to a deep cellulitis in the neck, which may involve and erode the walls of some of the large vessels and cause death from hæmorrhage.

Again, pus collected in the peri-tonsillar area may, instead of bursting into the mouth, burrow into the tissues of the neck, and lead to a suppurative cellulitis.

This complication is not common, and a case which I saw recently in the country may be given in illustration of its occurrence. A man about forty, while under treatment for a left-sided peri-tonsillar inflammation, continued at his work. He was assisting others in erecting a crane, and while engaged holding up a beam over their heads the supporting chain slackened and the beam suddenly bore heavily on them. He at once experienced severe pain in the neck,

as if he had cricked it. The accident was immediately followed by disappearance of the pain and swelling in the throat, but in its place there ensued an extensive and deep cellulitis of the left side of the neck, which, by the time I saw him—two days later—had displaced the larynx and trachea to the opposite side. Free incisions and drainage prevented further extension of the suppurative process.

Pus which has so escaped into the tissues of the neck may make its way down into the mediastinum. This latter complication is so rare that the following short notes of the only case which has come under my personal observation may here be of interest.

The patient, a married woman, aged 35, had had acute tonsillitis ending in suppuration so many times over a series of years, that she had learned both the course it pursued and the treatment which gave her relief most rapidly. On the occasion on which I saw her she had applied hot fomentations over the neck, and had used steam inhalations freely, and on the sixth day the abscess had burst. But while she obtained almost instantaneous relief, to her astonishment no pus appeared to come into her mouth, and she thought it must have been swallowed. On the following day she felt out of sorts, she was feverish, and had a cough; these symptoms were followed by swelling in front of the neck, discomfort over the chest, and difficulty in breathing. She then consulted her medical adviser, with whom I saw her, because of the increasing difficulty in breathing, on the evening of the fifth day after the bursting had occurred. There was then considerable dyspnœa, and her respirations were noisy. There was a fluctuant swelling in front of the neck, which extended from the level of the cricoid cartilage downwards to the clavicles, filling out the supra-sternal hollow. Her temperature was 102° F., the pulse was rapid and feeble, she was perspiring profusely, and had other evidences of septicæmia. I at once made an incision in the

middle line, as if for a low tracheotomy; a large quantity of foul-smelling pus escaped, and the dyspnœa was relieved. On extending the incision, it was found that the mediastinum was full of pus. This was carefully mopped out and the cavity drained, but three days later the patient died.

CHAPTER VII.

CHRONIC AFFECTIONS OF THE TONSILS.

Two distinct conditions are included under this designation, viz., (*a*) hypertrophy of the tonsils, and (*b*) chronic follicular tonsillitis.

(*a*) HYPERTROPHY OF THE TONSILS.

Enlargement of the tonsils is, as pointed out by Virchow, a true hypertrophy of the lymphadenoid tissue.

Etiology.—The enlargement may be congenital, the cause for which is unknown; or it may result from a solitary attack, or from repeated attacks, of acute tonsillar inflammation.

It is most frequently met with amongst children, when it is usually associated with hypertrophy of the adenoid tissue in the naso-pharynx, and it is often a manifestation of the strumous diathesis, although the apparent determining cause may be an attack of measles or of scarlet fever. An enlargement of the tonsils may appear for the first time at puberty, and on this point Dr. Prosser James, in 1859, drew attention to cases in females where affections of the tonsils were associated with the active development of the reproductive organs or with ovarian activity.

The **symptoms**, on account of which attention is called to the child's condition, are many, and of considerable import-

ance. They may be summed up thus:—Interference with respiration; thick speech and toneless voice; disturbed sleep; dulness in hearing; difficulty in deglutition. Some of these may be more marked than others, but where both tonsils are much enlarged, all those symptoms may be present.

Interference with **respiration**, which is the most serious in its consequences, is mechanical in character. The enlargement of the tonsil on each side, narrows the isthmus of the fauces, and thereby impedes buccal respiration. Nasal respiration is also interfered with, partly by the presence of the enlarged tonsils, but chiefly from hypertrophy of the glandular tissue in the pharyngo-nasal space (post-nasal adenoids), a condition almost invariably associated with hypertrophy of the faucial tonsils in children. When the child is at **rest**, respiration is harsh, noisy, and often irregular; during **exertion** it is laboured; while during **sleep** it is accompanied by a snoring noise; and from the difficulty then experienced in breathing, sound refreshing sleep is in many cases impossible.

At meals mastication is often incomplete, as the child is unable to keep the mouth closed for long, and the sounds caused by the child trying to breathe while eating is disconcerting to many.

Children with enlargement of the tonsils breathe constantly through the mouth, which necessarily remains open, and, as was pointed out by Sir Felix Semon, the development of the nostrils is arrested from want of use. The resulting change in the appearance of the face is characteristic: the face becomes elongated, the nose appears pinched, the alæ are collapsed, and the nares slit-like, the upper lip is prominent, and the mouth open. These features are exaggerated when the pharyngeal tonsil is also hypertrophied.

When the hypertrophy is congenital there is sometimes difficulty experienced in suckling a child so affected,

on account of its inability to breathe through the nose while at the breast. In such cases also the development of the chest may be seriously interfered with, and "pigeon-breast," that is a condition in which the ribs are flattened laterally and the sternum thrust forward, may, and often does, result from the interference with the supply of air to the lungs.

Speech is thick owing to the movements of the tongue and palate being interfered with by the swellings at the back of the mouth, and voice lacks tone, as the pharyngeal and nasal cavities are so encroached upon that they cannot act as resonators.

Dulness in **hearing**, which is frequently associated with enlarged tonsils, is sometimes the chief complaint on account of which advice is sought. This deafness does not arise from pressure upon, and blocking of the pharyngeal opening of, the Eustachian tube by the enlarged tonsil, as is sometimes stated. It is most usually caused by hypertrophy of the adenoid tissue in the naso-pharynx and around the mouth of the tube. In some instances the calibre of the tube is narrowed, or the tube may be actually closed, by an hypertrophy of its lining mucous membrane, the result of a chronic inflammatory process, which, beginning in the pharynx, spreads upwards towards the tympanum.

Difficulty in **deglutition** varies with the size of the tonsils and whether they are inflamed or not.

Diagnosis.—When the parts are examined there is no difficulty in recognising the condition, although enlarged



FIG. 30. — "Pigeon - breast," consequent on obstruction in the upper respiratory tract, caused by enlarged tonsils and hypertrophied adenoid tissue in the naso-pharynx.

tonsils differ much in appearance. They may occur as large, smooth, globular swellings, or the surface may be rough and irregular: and there may be a considerable space between them, or they may meet and lie in contact with each other in the middle line. Care should always be taken

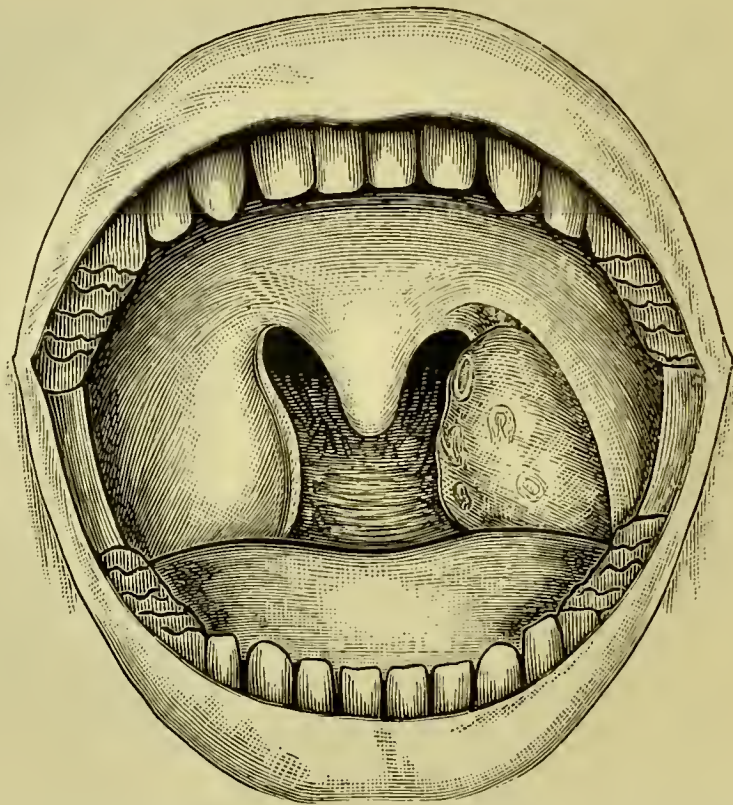


FIG. 31.—Chronic enlargement of both tonsils. On the right side the anterior pillar is adherent to and completely covers the front of the tonsil; on the left the hypertrophied gland stands out free of the pillars, and over its surface are several dilated lacunar openings.

to inspect the lower border of the tonsil, as occasionally it is pendulous in form, and the portion which lies below the level of the dorsum of the tongue may be much increased in size. Again, it may be observed that in place of the enlarged tonsil standing boldly out from between the pillars, it is seen to be covered by the anterior faucial pillar, which has become firmly adherent to the tonsil and is stretched over its anterior aspect.

Prognosis.—When the enlargement is congenital, or when the tonsils have become hypertrophied in early childhood, the enlargement persists as a rule and it tends to increase.

It may be that the hypertrophied tonsils give but slight inconvenience throughout the greater part of each year, but they are liable to become acutely inflamed at any time (this usually occurring in spring and in autumn), when the resulting symptoms are those of acute tonsillitis. They sometimes disappear spontaneously at puberty, and this fact is frequently used by parents as an argument against having them removed by surgical means. It must be remembered, however, that when puberty is reached they may not disappear—in fact it is the exception for them to do so—and in the interval the child suffers considerably each time the tonsils are inflamed; the speech is thick; the hearing may be permanently impaired; the chest, though perhaps not deformed, will not be fully developed; and the general health will have suffered more or less according to the size of the tonsils and the frequency with which they have been inflamed. During an epidemic of diphtheria, again, children with enlarged tonsils are more liable to be affected than those whose tonsils are normal in size.

Treatment.—The treatment adopted in hypertrophy of the tonsils must be constitutional as well as local.

Constitutional treatment, when the patient is a child, may be summed up in the administration of cod-liver oil along with iron, preferably in the form of *Liquor ferri perchloridi* or *Syrup ferri iodidi*: no tea; a plentiful supply of easily digested, nourishing food; clothing appropriate to the season, and exercise in the open air. In adults, general tonic treatment is also occasionally necessary.

Local treatment consists of the application of astringents and caustics, and of operative measures.

Astringent gargles and the painting of the surface of the tonsil with such astringent preparations as glycerine of tannin, and solutions of iron in glycerine or water, are frequently recommended, but their use in the majority of cases is to be deprecated, except perhaps immediately after an attack of

acute tonsillitis. On account of their astringency they may somewhat lessen the bulk of the tonsil, but they seldom, if ever, reduce the hypertrophy of tissue, and at best their effect is temporary.

Tincture of iodine painted over the surface may, when the tonsil is very flabby, lessen its size somewhat, but the application of iodine externally, apart from the comfort which a parent "may derive from the sight of a yellow stain upon the child's neck," as Dr. Edmund Owen puts it, is of no use whatever.

Injections of tincture of iodine, of acetic acid, etc., into the substance of the tonsil have been recommended, and electrolysis has also been practised.

Nitrate of silver, Vienna paste, chromic acid, and other caustics have been employed for the destruction of hypertrophic tonsils, and the late Sir Morell Mackenzie strongly recommended a mixture of caustic soda and unslaked lime in equal parts, which, when mixed with water, was known as London paste. Of it, he wrote, that its use "in many cases precluded the necessity for excision." It should be mixed with water only when about to be used, and it is applied to the tonsil with a spatula. It causes a slough of the portion to which it is applied, and by repeated applications the size of the tonsil is greatly reduced. It is a slow and painful method, and since the introduction of the galvano-cautery it has almost entirely gone out of use.

Indications for Operative Interference.—When the enlargement of one or both tonsils is such as to cause thickness of speech or to interfere with respiration, though it be only to a comparatively slight extent, the hypertrophied structure should be removed. Also where there are repeated attacks of acute inflammation of the tonsil or its follicles, abscission should be recommended as a preventive measure; and in such cases the time most suitable for its removal is when

the inflammatory swelling is subsiding. Where the cervical lymphatic glands are enlarged, the tonsils should be carefully examined, and if they are found to be abnormal they should be removed.

Operative measures may be divided into

- (1) Destruction of a portion of the tonsil by means of the galvano-cautery.
- (2) Amputation of a portion by *écraseur*, snare, bistoury, punch-forceps, or tonsillotome.
- (3) Removal of the whole tonsil by enucleation.

Position of Patient.—Except for the operation of enucleation the patient is seated in a chair, and the head is held by an assistant or nurse who stands behind the patient.

Local Anæsthesia.—When the patient to be operated upon is an adult, and in cases where there are no adenoids present, the operation may be performed painlessly by the local application of cocaine prior to operation.

For this purpose a 15 per cent. solution of cocaine hydrochlorate is firmly rubbed over the surface of the affected tonsil by means of a cotton-swab. Two or three such applications should be made, and at the end of two to three minutes local anæsthesia will be complete.

1. **Partial destruction.**—In the use of the *galvano-cautery* for the destruction of a portion of the gland, the surface of the tonsil, previously anæsthetised, should be slowly punctured at several points by the cautery at a dull red heat. The point of the cautery should be passed well into the substance of the tonsil to effect considerable destruction of tissue. The tissue thus destroyed sloughs, and cicatrisation, with consequent reduction in the size of the tonsil, results. Another method is to cut off a portion of the tonsil with a knife-shaped platinum point, but this procedure is only employed where there is reason to anticipate free bleeding, such as in patients the subjects of hæmophilia.

2. **Amputation.**—(a) In the removal of a portion of the tonsil, the *écraseur*, as used by Chassaignac, and by many surgeons since, may be employed. The *cold wire snare* is used by some, and the *galvano-cautery-snare* by others, on the ground that by such means there is less risk of hæmorrhage after the operation.

The majority of operators, however, prefer to cut the tonsil, using either a bistoury or some form of tonsillotome.

(b) When the *bistoury* is chosen, the tonsil is first grasped with vulsellum forceps, and drawn well towards the middle line. The bistoury should be probe-pointed, and the blade may be straight or curved according to the surgeon's fancy. It is held like a pen, and with it the tonsil is removed close to the border of the anterior pillar, being cut from above downwards with a back-and-forward sawing movement.

(c) The *tonsillotome* is, however, the instrument most commonly employed, as it is, in all ordinary cases, thoroughly satisfactory. There are two distinct types of such instruments, namely, the ring-guillotine, which cuts from behind forwards, and the spade tonsillotome, which cuts from before backwards.

In using the ring-guillotine, which is the invention of Fahnstock of Philadelphia, it is so held that when in position the fork will be on the side nearest to the middle line. The instrument is passed into the mouth on the flat: the tonsil is then encircled by the ring-end containing the knife, and the instrument is gently pressed in an

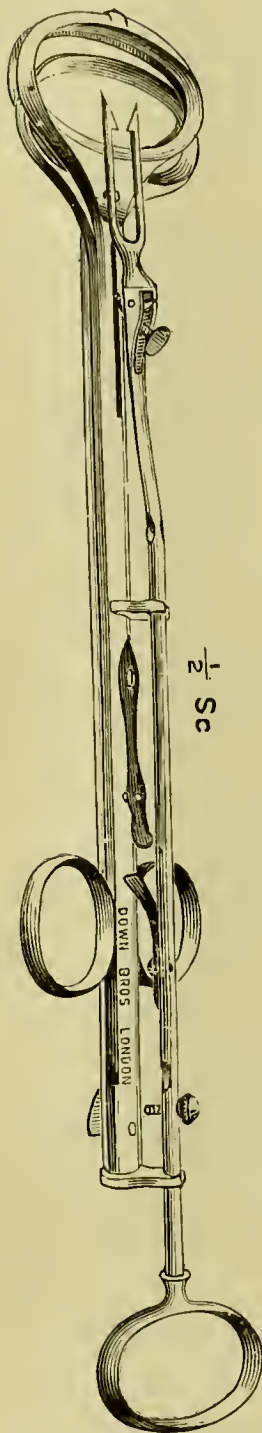


FIG. 32.—Fahnstock's guillotine.

outward direction, until fully two-thirds of the enlarged tonsil projects through the ring. The fork is then slowly and deliberately pushed backwards. The fork first transfixes the tonsil, and then pulls it further through the ring, the distance to which it does this being regulated by the screw placed close to the bifurcation of the fork. So soon as the fork has accomplished its two-fold duty, the knife is released automatically, and if pulled forwards sharply, cuts off the tonsil. The operation is thus completed, and the instrument with the tonsil is then withdrawn. All things considered, it is the most generally useful instrument for this purpose, although its delicate mechanism is sometimes a drawback. When, as is frequently the case, the fork is of soft metal, it may, in place of pulling the tonsil through the ring, curve deeply into the substance of the tonsil and lock with the blade as the latter cuts into the tonsil. Again, with this form one cannot accurately estimate in every case the proportion of tonsil which it will remove. A tonsil free from adhesions to the pillar, may be completely excised, while, in other cases, the fork, in place of dragging the tonsil into the ring, may simply tear through the tissue, and little more than mucous membrane may be removed by the knife.

By the use of the *spade tonsillotome* (which, as now employed, is Mackenzie's modification of the instrument invented by Physick, who, like Fahnstock, was a Philadelphian) much or little of the tonsil may be removed as desired. In its use it is necessary to have a skilled assistant, who, standing behind the patient, so places a hand on each side of the patient's head as not only to hold the head still, but to fix the tonsil about to be amputated. This is done by pressing the middle finger on the neck just below the angle of the lower jaw. Thus fixed, the tonsil is encircled by the ring of the instrument, which, in cutting the right tonsil, should be held in the left hand, and in the

right hand, when operating upon the left tonsil. With the ring around the tonsil, the instrument is pressed firmly outwards against the fixed point—the assistant's middle finger—and the blade is then sent home by the pressure of the thumb of the hand which holds the tonsillotome, or, better, by the thumb of the free hand.

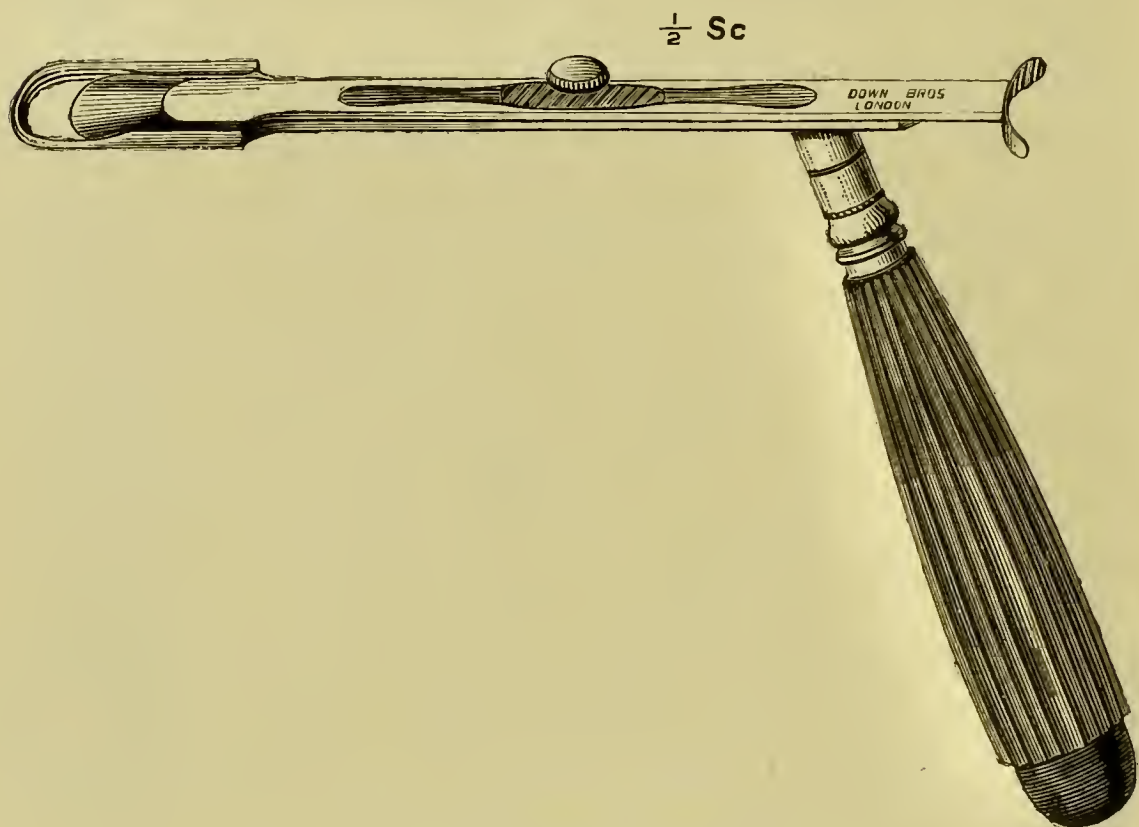


FIG. 33.—Physick's tonsillotome.

As the knife is being pressed backwards it sometimes pushes part of the tonsil out of the ring, so that the tonsil is only partially removed. This is most apt to occur where the instrument is too large. Beechag's tonsillotome was designed to prevent this accident. In it the spade-shaped knife is retained, and a fork is added by which the tonsil is transfixed prior to amputation.

3. **Enucleation** of the tonsil, an operation practised by the ancients, and reintroduced to the notice of the profession at intervals, is performed by means of scissors and the index finger.

This operation is called for where repeated attacks of acute tonsillitis have not been prevented by other methods of treatment, and in the removal of a tonsil affected by malignant disease. A general anæsthetic is to be preferred, though local anæsthesia may in some cases suffice; the mouth is held open by means of a gag, and the parts should be well illuminated. The mucous membrane is divided with scissors as it is reflected from the anterior pillar on to the tonsil; the finger is passed through the incision and around the tonsil, breaking down its attachments, and then by a twisting movement the tonsil is removed.

On two occasions I have enucleated the tonsil unintentionally. Both patients were girls about twelve years of age. In each case the tonsil was within the ring of the tonsillotome (Fahnestock's); it had been pierced by the fork and the blade was just entering it, when suddenly the child raised her hands, caught hold of the instrument, and violently wrenched it from the mouth, bringing with it, in each case, the entire tonsil. In neither case was there any untoward result.

Complications following Operative Procedures.—Of the complications which may follow removal of a portion or of the whole tonsil, inflammation, hæmorrhage, and septic infection are the chief.

(i) **Inflammation.**—After the use of the galvano-cautery, whether applied for puncture, for cutting, or as a snare, the surrounding parts become inflamed, the inflammation may spread to the fauces and palate, and occasionally it extends to the pharynx, from which it may spread to the Eustachian tube and, passing upwards, implicate the middle ear.

The employment of a warm antiseptic gargle (*see* Gargles) with which the parts may be laved, along with the use of marsh-mallow lozenges, following the operation, will, as a rule, prevent the appearance of any serious inflammation,

and these means will do much to relieve it when it has appeared. Where pain is a marked symptom, cocaine pastilles may, in addition, be employed with much benefit.

(ii) **Hæmorrhage.**—When a portion of a tonsil has been removed by a cutting operation, hæmorrhage necessarily follows, but as a rule the quantity of blood lost is trivial, and the bleeding usually ceases spontaneously. Following immediately on the removal of the tonsil, cold water should be sipped by the patient, as the act of deglutition is of material service in causing contraction of the cut vessels. If it is thought necessary an astringent may be added to the water, the most useful for such a purpose being a mixture of three parts tannic acid with one of gallic acid (London Throat Hospital Pharmacopœia). Of this mixture a teaspoonful should be added to a wineglassful of cold water and swallowed in sips. By such means bleeding ceases entirely within a very few minutes in the great majority of cases.

Occasionally a case may be met with where, notwithstanding those measures, hæmorrhage persists, or, having been checked, recurs.

In illustration I would briefly refer to a case which occurred in my hands, details of which were published in the *Edinburgh Medical Journal* for August, 1886. The patient, a tall, powerful policeman, was 34 years of age. When a lad he had acute tonsillitis, going on to suppuration, and this had recurred each subsequent winter with almost unfailing regularity, to his very great discomfort. Both tonsils were enlarged, and after a course of local treatment, as he objected to operation, I urged abscission. Both tonsils were removed. The amount of blood lost at the operation was perhaps somewhat more than is usual, but after the use of the tanno-gallic acid solution, which the patient sipped, it seemed entirely checked at the end of a few minutes. Six hours afterwards I was summoned

to see the patient. I then learned that for four hours after the operation the slight pain consequent on tonsillectomy was all that reminded him of the operation. At that time he went to stool where, his bowels being constipated, he strained rather severely, and while doing so he felt a trickling on the right side of the throat. This necessitated the frequent clearing of his throat, and on coming to the light he discovered that his expectoration was bright red, resembling pure blood. The cut surfaces were examined by me but no bleeding point could be discovered, so an astringent was applied, followed by the use of ice and the internal administration of ergot. Bleeding ceased for a time, but re-appeared, to be again checked by astringents and pressure; and these recurrences were so frequently repeated that the patient became blanched, and on attempting to sit upright on one occasion he fell back in a faint. Before attempting to ligature the carotid, which now seemed to be indicated, the actual cautery was applied over the cut surface of the right tonsil, the tongue and cheeks being protected the while. This served to completely arrest further bleeding, and with the help of a chalybeate tonic and a plentiful supply of fluid nourishment, he was, at the end of two weeks, able to go to the Highlands, where he rapidly recovered.

This complication of a comparatively simple, and in many cases most necessary, operation is very rare, judging from my own experience and from the small number of cases put on record. In considering its source I would here express my firm conviction that in the operation of abscission of the tonsil, so long as the section is made—with bistoury or with guillotine—on the inner side of the line of the anterior faucial pillar it is impossible to injure the internal carotid artery, however abnormal its course may be. This is important, as the very thought of the close proximity of this vessel to the tonsil is a terror to many when called

upon to operate. In every reported case which I could find described in detail—and in some of them the common carotid artery was ligatured to check the hæmorrhage—in no case was the carotid found to have been injured in the removal of the tonsil. In several of the reported cases of hæmorrhage from the tonsil, the tonsil had been *incised*, the incision in all probability going a good way outside the line of the pillars, and yet where death followed ligature of the carotid, it was discovered that the hæmorrhage had not been due to injury of that vessel. (I have been told of a case where an aneurism of the internal carotid was mistaken on a hurried examination for a quinsy, and opened, with an almost immediately fatal result.) The ascending pharyngeal artery which lies between the internal carotid and the pharynx might possibly be damaged, but only I think in unwarrantably free incisions into the tonsil, and never in cases of abscission pure and simple.

Excessive hæmorrhage may occur after tonsillotomy in those the subjects of hæmophilia: and where this dyscrasia is known to the surgeon he should employ other means than cutting to reduce the size of the tonsils.

Source of Hæmorrhage.—The most common cause of serious hæmorrhage will be found in the condition of the tonsil itself. Where abscission of the tonsil is called for, that gland is usually considerably hypertrophied, and has been the seat of oft-repeated attacks of inflammation of the substance, or of the follicles, of the organ. As a result the tonsil is not only larger than normal, but it is also harder in texture. The vessels bearing its blood-supply are imbedded in the firm fibrous substance of the tonsil, and cannot so readily contract when cut across, so bleeding is less easily checked by simple means. Such appeared to be the cause of bleeding in the case detailed. Hæmorrhage was checked over and over again by the formation of a clot at the mouth of the cut vessel. The vessel, however,

could not contract on account of the hard firm tissue surrounding it, and the clot was displaced, and blood escaped afresh.

So far, then, as regards the tonsil itself, if the guillotine be used, the cut surface of the tonsil *should* be the only possible seat of hæmorrhage. If, however, the bistoury be employed we introduce a new element of danger. The incision may not be confined to the tonsil, but one or other of the pillars may be scratched or cut, leading to smart hæmorrhage, as in a case reported by Billroth (*Lancet*, 1870, vol. ii.); or should the bistoury not be probe-pointed, the mucous membrane of the posterior wall of the pharynx may be incised or an aberrant vessel may be opened, resulting in troublesome bleeding. Thus to the list of sources may be added those three, which may be called "extra-tonsillar," in contradistinction to the possible sources of hæmorrhage from the tonsil itself.

Frequency of Post-operative Hæmorrhage.—The question of the occurrence of hæmorrhage after tonsillotomy may be fairly summed up thus:

- (1) In a large majority of cases no trouble is experienced after the operation of tonsillotomy; the bleeding quickly ceases either spontaneously or by the use of simple remedies.
- (2) A moderate hæmorrhage requiring the direct application of a hæmostatic occasionally occurs.
- (3) A serious hæmorrhage—serious as regards both immediate and remote results—is comparatively rare.
- (4) A fatal hæmorrhage is possible, but *very* rarely occurs.

Treatment of Post-operative Hæmorrhage.

- (1) In every case immediately after removal of the tonsil, the patient is caused to sip cold water, with or without the addition of the tanno-gallic powder.

- (2) If after using the above, bleeding persists, and particularly if the blood escapes from the surface generally, a small piece of sponge held by forceps and soaked in supra-renal extract is pressed firmly over the raw surface. This quickly causes blanching and arrests the flow. Should the patient be a bleeder, the cut surface should be seared with the actual cautery as soon as the bleeding has been checked by the application of the extract.
- (3) Where there is a definite bleeding point or a spouting vessel, the point should be caught up with artery forceps, a silk ligature passed around it, and the vessel secured.

(iii) **Septic Infection.**—The cut surfaces usually heal quickly and without trouble. Where the patient's teeth are in an insanitary condition the wound may become infected, but the resulting inflammation is rarely of a serious character. Should a tonsil be excised during the prevalence of diphtheria in the neighbourhood of the patient's residence, there is considerable risk of that patient contracting the disease. The poison readily gains access to the raw surface, and when once implanted is quickly absorbed. In a case which came under my observation many years ago, the tonsils were removed at a general hospital and the patient straightway taken to her home in a neighbouring town, where, as it happened, there were several cases of diphtheria. Three days after the operation the child was found to be suffering from the disease, with copious false membrane, and a fatal issue followed within a week.

Occasionally on the second or third day after the operation the cut surface may be found to be covered with a greyish membrane, composed partly of sloughing tissue and partly of a fibrinous exudation. This is not to be confused with diphtheria. It is most apt to occur when the patient

is weakly and when the child's surroundings are of an unhealthy character, or where the parts have been bruised during the operation. A solution of nitrate of silver (20 gr.— $\bar{3}$ j) painted over the surface, and followed by the frequent use of an antiseptic gargle (Condy's fluid or carbolic acid), will rapidly clean the surface and permit the healing process to terminate satisfactorily. The best medicinal preventive is the regular administration of dilute hydrochloric acid with pepsin for a few days prior to the operation, and its continuance thereafter until the parts are healed.

Remote Results.—When recommending abscission of one or both tonsils, the patient, if an adult (or the parents in the case of a child), desires to know if the operation will prevent further trouble with the throat. To give an evasive reply lessens the confidence of the patient, and yet one cannot in every case make answer with an unqualified affirmative. As the result of inspecting a large number of cases twelve months and more after the removal of one or both tonsils, the following are my conclusions on this point:—In the great majority of cases of chronic enlargement, when the child is fairly healthy and where at least two-thirds of the gland have been removed, the tonsil does not again become enlarged, nor does it readily become inflamed. In a small proportion of cases, and particularly in children of the “strumous habit,” in whom the tissue of the tonsil is soft and flabby, the portion of the tonsil left at the time of operation may become inflamed and become permanently increased in size. This may occur within a very short time after operation; and it is specially liable to occur where the operation has been performed in a very young child.

When the tonsil is removed on account of repeated attacks of inflammation in those more advanced in life, immunity from further attacks is secured in the majority

of cases. In a small number of cases the stump may continue to become inflamed, but when this does occur the attacks are much less frequent, they are much less severe and of considerably shorter duration than those experienced prior to the operation.

(b) CHRONIC FOLLICULAR TONSILLITIS.

Here there is a chronic inflammation of the lacunæ of the tonsils, accompanied by an alteration in their secretion, some of which is retained within the dilated follicles.

Etiology.—This form of tonsillitis may result from an attack of acute follicular tonsillitis, or it may occur in those the subject of chronic articular and muscular rheumatism, and in those inhabiting insanitary dwellings. It is met with more frequently in adults than in children.

Symptoms.—Frequently there are no subjective symptoms. Usually the patient complains of a disagreeable taste in the mouth: or there may be a sense of fulness in the neighbourhood of the tonsil and fauces, which fulness may extend to the pharynx or even up to the ear. The feeling of fulness in some cases may amount to pain, or it may excite a sense of irritation in the throat, causing cough, and sometimes it produces a feeling of obstruction at the posterior nares. Further, there is occasionally discomfort and even difficulty in swallowing. The apparent severity of the symptoms depends more on the sensitiveness of the throat and on the temperament of the patient, than on the amount of secretion present. Occasionally the patient complains of the coughing up of foul-smelling and foul-tasting pellets.

Diagnosis.—In chronic lacunar tonsillitis, the tonsils are not necessarily enlarged, but whether they be so or not the individual crypts are more than usually prominent, and one or many of them may be filled with foul-smelling inspissated matter. This matter becomes moulded into rounded

plugs or pellets, which occasionally escape into the mouth spontaneously, and which can be easily dislodged by pressure. The pellets consist chiefly of altered follicular secretion, mixed with epithelial debris and septic organisms. The readiness with which these whitish spots of secretion are removed, serves to differentiate between this condition and keratosis of the tonsil.

Treatment.—Where the tonsils are enlarged they should be removed by the guillotine in the manner described under treatment of simple hypertrophy of the tonsil.

Where the tonsil is not enlarged, or but slightly so, it has been recommended that after the secretion has been squeezed out, the interior of the crypts should be swabbed with strong astringent or caustic solution, or that solid nitrate of silver or chromic acid should be applied to the cavities.

Some surgeons break down the walls of neighbouring follicles by means of a blunt hook; while others open the affected follicles freely by cutting through their walls with a sharp tenotomy knife, scrape out the retained secretion with a sharp scoop, and then apply the galvanocautery to the interior of the distended crypts. This is the method I usually employ, but in place of using the cautery after the walls of the crypts have been slit, I remove as much of tonsil-tissue as is possible. This is best accomplished by employing curved scissors with long handles. The piece of tonsil to be removed is picked up with vulsellum forceps, the part so held being clipped away, and this process is repeated till the walls of the crypts have been removed. This piecemeal removal requires much patience, but the results are better than those obtained from the use of the cautery or of punch-forceps.

(c) CALCULI IN THE TONSILS.

A calculus is occasionally found in the tonsil, and its presence is, in many instances, discovered by accident during the cutting of the tonsil.

Etiology.—The calculus forms in one of the crypts or follicles of the tonsil, or in the supra-tonsillar fossa; it is the result of the deposition of the phosphate or the carbonate of lime in some follicular secretion which has been retained in one of these recesses.

Occasionally salts of lime become deposited between the filaments of leptothrix on the pharyngeal wall, leading to the formation of small gritty foreign bodies, which are sometimes described as calculi of the pharynx. It is held by some that leptothrix determines the precipitation of the lime as a carbonate in all cases, and is thus the determining cause in the formation of pharyngeal and tonsillar calculi.

Size.—Calculi of the tonsil vary in size. Small gritty deposits are not uncommon; larger well-shaped calculi are very rare. The one depicted here was formed high up in the supra-tonsillar fossa in a man of forty-five, who had no history of either gout or rheumatism, and it ulcerated its way through the soft palate. While its surface is comparatively smooth, it is hard and resembles a well-formed phosphatic urinary calculus.



FIG. 34.—Calculus removed from the tonsil.

Symptoms.—The presence of a small calculus in the tonsil is usually attended by a sense of discomfort, chiefly of the nature of fulness, though in many cases there are no symptoms. When the calculus is a larger one, the discomfort may amount to pain, and the soft tissues may become inflamed. Ulceration may follow, and through this process the calculus may make its way to the surface; or an abscess may form, and lead to the expulsion of the

foreign body. In some cases a chronic abscess of the tonsil is directly due to the retention of a calculus.

Treatment.—A small calculus may be squeezed out of the follicle in which it lies, or it may be scooped out by means of a surgical director, or similar instrument. Larger ones are usually diagnosed during the process of suppuration, or when the surface has become ulcerated, in which circumstances it may be removed with a spoon-shaped instrument, with, it may be, enlargement of the opening by incision.

Following the extraction of the calculus, the tonsil, if enlarged, should be removed, and in any case the cavity in which it lay should be obliterated by curettage or by cauterisation.

(d) CYSTS OF THE TONSIL.

Under this title may be described the small superficial collections of pus-like fluid which are occasionally seen when the tonsils are under examination.

Etiology.—Such a collection of purulent fluid may either be of the nature of a retention cyst or of a chronic abscess.

Symptoms.—There are usually no symptoms, and the patient may be unaware of the abnormality, but occasionally local discomfort of a “choking” character is complained of.

Diagnosis.—The cyst may occur on any part of the surface of the tonsil. It is slightly raised, and the elevated area is of a yellowish colour. It is covered with attenuated mucous membrane, the blood vessels of which may be seen against the pale colour of the contents, and is, unlike the secretion retained within the follicles of the tonsils, devoid of odour.

Treatment.—The surface having been anæsthetised, the thin cyst wall should be laid open with a bistoury, and the cavity cleaned out with a cotton-swab. This may be followed by the use of an antiseptic mouth-wash, and further treatment is rarely necessary.

Unusual Case of Tonsil-Cyst.—In April, 1907, I saw a young lady who had had much trouble with the right side of her throat during the whole of the previous winter. The right tonsil was enlarged, and felt unusually firm on palpation, and the posterior pillars seemed pushed backwards towards the pharynx. I decided to remove the outstanding portion of the tonsil in the first place. As the knife of the guillotine cut into the tonsil there was a gush of straw-coloured fluid from the cut surface, part of which squirted out of the mouth and over my coat, and a quantity of it fell into the patient's mouth; the whole quantity I roughly estimated to be from three to four teaspoonfuls. Nothing further was required, the whole swelling collapsed and the discomfort disappeared.

CHAPTER VIII.

MALIGNANT AFFECTIONS OF THE TONSILS.

THE tonsils are the seat of **malignant disease** more frequently than is usually supposed or than might be inferred from the references made to the subject by the authors of most of our text-books on general surgery, and this fact is worthy of note.

Sarcoma, epithelioma, and scirrhous may each be encountered as a primary affection of the tonsil, and according to my own experience they, as regards frequency, occur in the order mentioned.

(I.) SARCOMA OF THE TONSIL.

Sarcoma is the most common of the malignant diseases which affect the tonsil, and while nearly every variety of sarcoma may be met with in this situation, the round-celled and the spindle-celled are of most frequent occurrence. In its earlier stages, sarcoma of the tonsil is usually mistaken for a chronic or sub-acute parenchymatous tonsillitis. One tonsil or both may be involved. In ten patients who have been under my care with sarcoma of the tonsil, seven had both tonsils affected, while in three cases only was one tonsil alone involved. Primary sarcoma of the tonsil, which must not be confused with Hodgkin's disease (lymph-

denoma) or with diffuse lympho-sarcoma, may occur at any age. I had a child only $4\frac{1}{2}$ years old referred to me with primary sarcoma of one tonsil, and I have enucleated the tonsil for sarcoma in a woman of 58.

In the early stage of sarcoma of the tonsil it is the exception to have the cervical glands enlarged, and the occurrence of ulceration, of sloughing and hæmorrhage, which are described as things to be looked for as the disease progresses, have in my experience been rare.

The symptoms depend largely on the size of the growth. Thickness of speech, with throaty voice, similar to that of a patient with hypertrophied tonsils, may be the first complaint, and following this there may be some difficulty in swallowing and in breathing, which tend to increase as the tumour grows larger. Pain is not of frequent occurrence; but the patient slowly loses flesh and becomes enfeebled, so that he is readily tired and feels himself unable to perform his accustomed work.

Diagnosis.—Early diagnosis is most important, and yet it is often difficult in the early stages to distinguish between sarcoma of the tonsil and sub-acute tonsillitis. In shape, in size, and in colour the tonsil is very similar in both cases. But pain, which is a marked feature in parenchymatous tonsillitis, is practically absent in sarcoma: and while the former will, within a limited time, end in resolution or in suppuration, the sarcoma continues slowly to increase in size, and the patient's health gradually becomes affected, as shown by lassitude, loss of flesh, and impairment of strength. To confirm the diagnosis in doubtful cases, a portion of the affected tonsil should be removed for microscopical examination.

Prognosis.—The prognosis is determined by the stage at which the disease is recognised, by the character of the sarcoma, and by the completeness with which the new growth can be removed. The prognosis is most favourable

in the spindle-celled sarcoma, for, as shown by Dr. Newman, the disease in this form remains eneapsuled for a considerable period, and the glands remain unaffected. Where the disease, then, is confined to the tonsil, and particularly if it be of the spindle-celled variety, immunity for months, and sometimes for years, may follow the enucleation of the affected tonsil, but where the glands are also involved the prognosis is much less favourable. When the disease is not removed by operation, life is rarely prolonged beyond eighteen months from the first appearance of the swelling, and in many instances the patient succumbs much sooner. As the primary disease progresses, secondary tumours may appear in the palate, the pharynx, or the neck, some of which occasionally attain to a great size.

Treatment.—Where the disease is confined to the tonsil, that structure should be enucleated. This operation may be done through the mouth, held widely open by means of a gag, and anaesthesia may be produced by the local application of cocaine with adrenaline, or by the administration of chloroform.

The faucial pillars, if adherent, should first be stripped off the tonsil with the finger-nail or with a periosteal elevator, and the tonsil then completely removed by carefully tearing through its attachments with the nail of the forefinger, helped by the cautious use of scissors curved on the flat. The operation is almost a bloodless one, and if the tonsil is twisted as it becomes separated no ligatures are necessary. If there are any enlarged glands in the neck these should be very carefully and completely removed by an external operation.

Inoperable cases, whether they be primary growths or cases of recurrence after operation, may be treated by the injection of Coley's fluid, which consists of the mixed toxins of erysipelas and bacillus prodigiosus. Its use was suggested by the fact that inoperable sarcomas have been known to

disappear, and the patient to remain well and be permanently cured, as the result of an accidental attack of erysipelas. In fully 75 per cent. of all cases of sarcoma recurrence takes place after operation, and eventually they become inoperable. Coley holds that there is no appreciable risk from the use of the mixed toxins in the treatment of sarcoma. He reports having used the mixed toxins in 430 cases, and in only three of those could death be attributed to the toxins; and each of those three patients was in the last stages of the disease, with extensive metastases and very feeble heart action. On the other hand, in 47 of the 430 cases of sarcoma treated by him the tumour disappeared completely, and in 28 of these a period varying from three to fifteen years had elapsed since their disappearance.

One of the several cases on which I have operated was a woman of fifty-eight years, and as I know her subsequent history the case may be cited. Early in January, 1898, she first had a sense of fulness and discomfort in her throat, particularly on swallowing. It came on without any apparent cause, and at first gave her no concern. She consulted a doctor in March, who informed her that the tonsil was inflamed, and an astringent application was prescribed. She continued to apply the astringent till June. During those three months she not only felt no local improvement, but was convinced that the affected tonsil was slowly increasing in size. She also felt that she was losing flesh, and becoming so weak generally that she was quite unable to perform her ordinary household duties. In June she consulted another doctor, who proposed to excise the affected tonsil, but on her return two weeks later to have this done the tonsil was found to have increased so much in size in that interval that he deferred operation.

Her doctor sent her to me on the 17th of August, by which time there was no doubt as to the nature of the new growth. Her temperature was normal. She appeared to

be in moderately good health, though she complained of weakness and exhaustion on slight exertion. Her speech was somewhat thick, and she complained of occasional pains shooting up to the right ear from the right side of the throat. She could swallow with comparative ease.

On examination a tumour occupying the position of the right tonsil was seen, somewhat resembling an hypertrophied tonsil. It was barely the size of an average walnut. It had the form of an enlarged tonsil, and was of a deep red colour. It was firm to the touch, non-fluctuant, and palpation caused no pain. The faucial pillars were not adherent to the tumour, which was as a consequence freely movable, and the lymphatics were unaffected. Four days later I operated under chloroform, enucleating the new growth with the finger-nail and scissors. Firm pressure over the raw surface checked what little bleeding there was, and further treatment consisted in the sucking of ice and the administration of dilute hydrochloric acid in small doses.

Professor A. R. Ferguson, who cut and examined sections of the tumour, reported that the growth was a spindle-celled sarcoma—"the cells were large, uninuclear, and spindle-shaped."

The patient returned home on 2nd September with the parts completely healed. She improved in every respect after the operation, and remained very well for two years and two months. She then felt a fulness just behind the angle of the right lower jaw, but she paid no attention to it and did not see her doctor till later. When I again saw her, in January, 1902, the space between the angle of the jaw and the mastoid process on the right side was occupied by a hard, firmly fixed new growth. In the mouth there was a small smooth rounded new growth projecting from the soft palate, and on palpation the right half of the palate and the right side of the pharynx were found to be the seat of an infiltration, hard, nodular, and firmly fixed. The

woman was then stout and florid, and apart from pain and throbbing in the right ear, aggravated on lying down, she made no complaint, but extirpation of the new growth by further operative measures was considered to be impossible. She returned to the country, where she died about six months later.

(II.) EPITHELIOMA OF THE TONSIL.

Of the carcinomata, epithelioma is the variety most commonly met with here. Epithelioma involves the tonsil more frequently by extension from neighbouring structures, chiefly from the tongue, than primarily: but undoubted cases in which the diseased process has its origin in the tonsil do occur. Epithelioma is much more common in the male than in the female, and it usually appears after middle life.

Symptoms.—For a time there may be no symptoms to indicate the presence of disease. The first complaint is usually of slight discomfort on one side of the throat, with irritation or a disagreeable tickling sensation, almost amounting to pain, in the ear on the same side. When ulceration occurs, pain becomes a prominent symptom. The pain is lancinating in character, it shoots up to the ears, is increased by swallowing, and is often out of all proportion to the size of the local sore. The breath becomes very fetid, there is troublesome salivation, and later there is expectoration of foul blood-stained muco-pus. The lymphatic glands are involved early in the course of the disease, the patient loses flesh and strength, and cachexia follows in the train of symptoms.

Diagnosis.—Epithelioma of the tonsil when first seen may be mistaken for a syphilitic lesion, and the diagnosis is sometimes rendered the more probable by the patient's past history. But even on careful examination it is sometimes

PLATE V.



Leucoma (or Leukoplakia) of the palate of old standing in a man 64 years of age, who also had, when this sketch was made, an extensive EPITHELIOMA of the right anterior pillar and tonsil, with involvement of the deeper lymphatic glands.

most difficult to differentiate between an epitheliomatous and a tertiary ulcer of the tonsil when the patient is well past middle life.

In epithelioma there are two important features to be noted, (*a*) early enlargement of the glands, and (*b*) the infiltrating character of the growth, which latter gives to the advancing border of the ulcer that degree of elevation



FIGS. 35 AND 36.—Malignant tumour simulating a growth of the mastoid. The disease began as an epitheliomatous ulceration of the right fauces and tonsil, from which it spread to the naso-pharynx, and in its progress upwards implicated the right facial nerve.

and induration which can be appreciated by careful palpation, and which is absent in syphilitic ulcers. The occurrence of severe shooting pains is suggestive of malignant disease.

A course of anti-syphilitic remedies may clear up the diagnosis, but it must be remembered in this connection that the administration of iodide of potassium sometimes induces a marked, though but temporary improvement in malignant ulcers. In all doubtful cases a portion of the new growth should be removed and examined microscopically.

Prognosis.—A patient with an epithelioma involving the tonsil usually dies, if left untreated, well within twelve months from its first appearance. This term may be extended if the disease is limited and it be excised. Death

usually occurs from exhaustion, resulting from his inability to take food, from his rest being broken by excessive pain, and by constitutional contamination. The occurrence of hæmorrhage may accelerate, or may directly cause, the fatal issue.

Treatment.—(a) **Operative.** Where the disease is confined to the tonsil and in an early stage, enucleation of the tonsil and the removal of the lymphatic glands on the affected side of the neck, whether they be enlarged or not, may be practised, with the hope of a satisfactory result. But where the surrounding structures—the tongue, the pillars of the fauces, the palate or the pharynx—are implicated, a much more extensive operation is necessary for the eradication of the disease. For this purpose the cheek may be split from the corner of the mouth right back to the angle of the lower jaw, or the affected parts may be exposed by a lateral pharyngotomy. In either case the diseased structures are removed with scissors, and in their removal a wide margin of healthy tissue should be included. In all those cases no operation can be satisfactory unless accompanied by the free extirpation of the lymphatic glands. Where either of those methods is adopted a preliminary tracheotomy is an advantage, and the severity of the operative procedures may be lessened if the trachea be opened a day or two before the major operation is performed.

(b) **X-rays and Radium.**—Both X-rays and radium have been proved to exert a certain curative influence when directly applied in cases of external epitheliomata. I have not employed either of those means for the treatment of malignant disease of the tonsil, palate or adjacent parts in the early stages, but I have used both in advanced, inoperable cases. In those cases in which it was used, great improvement took place in the condition of the ulcerated surface, and in some cases the indurations disappeared and

the ulcer actually healed, although the disease in the lymphatics continued to advance.

Of the two agents, most help in the treatment of epithelioma may be expected from radium. Already excellent results have been obtained from its application in the treatment of epithelioma of the tongue and the lip by Dr. Dominici.

But radium must not be applied in a haphazard fashion. Investigation of the properties of radium has proved that it emanates at least three kinds of rays, and these have been designated the alpha, the beta, and the gamma rays.

The *alpha rays* are composed of ions of fair size, they carry a charge of positive electricity, they have little penetrating power, they have a relatively slow velocity, and they cause irritation, and may lead to troublesome ulceration of the skin.

The *beta rays* are composed of ions of smaller size, they carry a charge of negative electricity, they have great penetrating power, and move with a high velocity.

The *gamma rays* contain no ions, they carry no electric charge, they have enormous penetrating power, and their velocity is equal to that of light.

The penetrating power of these three kinds of rays is expressed thus: The alpha rays are stopped by a sheet of mica, and their power of penetration is taken as 1. The beta rays have a penetrating power of 100, and will pass through a centimetre of lead. The penetrating power of the gamma rays is 10,000, and they will pass through one inch of steel.

In the application of radium to treatment, Sir Frederick Treves, in a recent lecture reported in the *British Medical Journal*, stated that "it is ridiculous to attempt to apply radium as a broken up bead in a glass tube, without any notion of the amount of alpha, beta, and gamma rays that are being used, or how far the radiation extends. In applying radium surgically you want surface, or in other words,

a little radium spread over an even surface is much more powerful, and can be much more exactly used, than a bead of it in a glass tube."

Powdered radium may be mounted on gum-elastic, silk or cloth, and covered over with a varnish, and the power of any prepared plate of radium can be accurately estimated by the electrometer, and in its application the alpha or irritating rays may be cut off by the interposition of a very thin plate of aluminium.

The use of radium in the treatment of disease is only in its infancy, and much yet remains to be done by the experimental investigator.

(c) **Palliative Measures.** In cases where the disease cannot be removed by operation, on account of its extent, or the enfeebled state of the patient's health, and where other means are not available, treatment resolves itself for the most part into the relief of pain, and the keeping of the affected surfaces clean. But the progress of the disease may sometimes be influenced for good by the administration of arsenic and iodide of potassium, and the systemic infection, resulting from the swallowing of the foul-smelling secretion, may be considerably modified by the addition of pepsin in solution.

Cleansing of the surfaces by means of warm, watery solutions of antiseptic substances, not to be gargled but to be used as a mouth-wash, is of the greatest importance and is most comforting to the patient. The use of lozenges is to be deprecated in the majority of cases on account of the increase of saliva occasioned by their presence in the mouth. Instead of these, a mixture of biborate of soda, chlorate of potash, and powdered sugar, in equal parts, may be used. A few grains at a time should be frequently applied to the tongue, where it dissolves and is swallowed. It keeps the ulcerated surface comparatively clean, and as a consequence lessens the foul odour of the breath.

For the relief of pain many things may be used. Bromide of potassium combined with tincture of hyosciamus, may in the earlier stages give much comfort, but later morphia becomes necessary, and then it is best given hypodermically.

Painting the ulcerated surface with a 15 to 20 per cent. solution of cocaine may give much ease, and its application just prior to the taking of food enables the patient to take sufficient nourishment with comparative comfort.

Orthoform, iodoform and iodol have each been employed for a like purpose, but they are of but doubtful efficacy. Where by extension of disease respiration becomes difficult, tracheotomy may be called for to avert death from suffocation, and in like manner where the disease interferes seriously with deglutition, gastrostomy may be resorted to, to prevent death from starvation.

Hæmorrhage from the surface, which may occur during the progress of any of the forms of malignant disease here or elsewhere, may be checked by the application of various hæmostatics. The use of ice, the local application of tannic acid, or of supra-renal extract may each be recommended. When the ulcerative process invades the deeper structures, the larger vessels may become involved, and a severe and even a fatal hæmorrhage may result.

(III.) SCIRRHUS OF THE TONSIL.

Scirrhus of the tonsil is of very rare occurrence, and in the few reported cases the diagnosis has been doubtful until the nature of the growth was declared by microscopic examination.

The tonsil affected by scirrhus becomes intensely hard; for a time the tonsil may be alone involved, but later the lymphatics become infected.

Where the disease is limited to the tonsil, the latter should be enucleated so soon as the diagnosis has been made.

The lymphatics should be carefully examined, and, if they are implicated, they should be carefully excised.

PLATE VI.



This patient had an epithelioma of the uvula which was removed, and four years later, a scirrhus developed in the left tonsil. Plate shows absence of the greater part of the soft palate consequent on the operation for the removal of the uvula, and the presence of a very hard tumour of the left tonsil.

CHAPTER IX.

POST-NASAL ADENOIDS.

ON the **posterior wall of the pharynx**, above the level of the free border of the soft palate, there are numerous lymphoid follicles, distributed over the surface generally, though they are most numerous towards the middle line between the Eustachian tubes. This collection of lymphoid tissue, which extends up to the vault of the nasopharynx, is termed Luschka's tonsil, or the pharyngeal tonsil. Hypertrophy of these follicles, now spoken of as post-nasal vegetations or adenoids, and the train of symptoms which result from their presence, were first fully described by Meyer of Copenhagen in 1868, since which time the profession as a whole has recognised the powerfully prejudicial influence they may exert on the economy.

Etiology.—**Hypertrophy of Luschka's tonsil** is in most cases associated with enlargement of the faucial tonsils, and anything which leads to enlargement of the latter, favours hypertrophy of this aggregation of lymphoid tissue. Chief amongst the predisposing causes are perhaps the strumous diathesis and dampness of habitation; and naso-pharyngeal

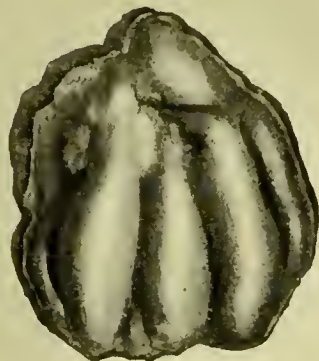


FIG. 37.—An average-sized mass of post-nasal adenoids, showing the lobulated character of its surface.

catarrh, or any septic infection such as may be associated with measles, or scarlatina, may act as the exciting cause of their increased growth.

Luschka's tonsil is normally present in young children, and as age advances it tends to become atrophied, so that long before the period of puberty little trace of its previous existence can be detected. Enlargement of this adenoid tissue² is often first observed between the ages of 3 and 10 years, but the hypertrophy of the gland may occasionally be so great in young infants as to necessitate

its removal by operation. We may thus infer that at least occasionally the enlargement is congenital. Several children in the same family may be similarly affected, the narrow formation of the nose which favours their growth, and the tendency to glandular enlargement, being inherited.



FIG. 38.—The “adenoid facies.” Mouth constantly open; nares narrowed from collapse of the *alæ*; dull expressionless features.

The **physiognomy** of a child with adenoid vegetations in the nasopharynx is characteristic, and is readily recognised by the experienced surgeon. It consists of slight drooping of the eyelids, thickening

of the tissues over the bridge of the nose, which is rendered more prominent by the collapsed condition of the *alæ nasi*, while the mouth is almost constantly open, for children with adenoids are habitual “mouth-breathers.” There is an absence of expression in the features, or they wear a look of sadness.

Symptoms.—The presence of hypertrophied adenoid tissue in the naso-pharynx interferes with nasal respiration, and as a consequence it affects the child's speech and sleep, mastication, deglutition, and nutrition. It likewise inter-

feres with the normal development of the chest, it is a source of nasal catarrh, and is a cause of earache, deafness and aural discharge. It may lead to hæmorrhage from the nose and mouth, and it dulls the mental faculties in many cases (aprosexia).

(1) *Respiration*.—The posterior nares being in great measure blocked by the adenoids in the post-nasal space, the child constantly breathes through the mouth, which is necessarily more or less open at all times. The respirations are as a result audible when the child is awake, and they are accompanied by a snoring noise during sleep. The fauces and pharynx may become coated with dried secretion, which may excite a frequent hacking cough, and occasionally asthma may result as a reflex neurosis.

(2) *Speech* is thick, and pronunciation is indistinct, and certain words into the formation of which the letters *m* and *n* enter are pronounced as if the nose was blocked. The voice also lacks resonance. Stuttering and stammering are sometimes due to the presence of adenoids and may be cured by their removal.

(3) *Sleep* is broken and is not restful, on account of the difficulty in respiration. Frequently the child will wake up choking or gasping for breath, and sometimes wakes in a state of terror.

(4) *Mastication*.—As the child cannot keep the mouth closed sufficiently long for purposes of mastication, the food is frequently swallowed without the necessary preparation, and digestion and nutrition may suffer. There may also be difficulty in swallowing food, partly from this cause, but chiefly because of the blockage of the nose and nasopharynx.

(5) *Deformity of Chest-wall*.—Defective development and deformities of the chest-walls are frequently seen in children with adenoids, and particularly when the adenoids are associated with great enlargement of the faucial tonsils.

The most common deformity is that known as "pigeon-breast," in which the lateral walls are flattened and the sternum is unduly prominent. Such children are not infrequently prone to attacks of bronchitis.

(6) *Nasal Catarrh*.—Children with adenoids "take cold" readily, and as the nose cannot be cleared by blowing, the nasal cavities may become filled with secretion which

trickles into the naso-pharynx or through the anterior nares.

(7) *Deafness*.—A large percentage of those, the subjects of adenoids, suffer from deafness. Where a child has attacks of deafness which clear away and recur with every fresh "cold," the deafness is almost certainly due to the presence of adenoids, and it may be caused by simple blockage of the pharyngeal orifice of the Eustachian tube by the swollen mass of gland tissue. In other cases the cause is inflammatory, and by extension along the Eustachian tube to the tympanum it may give rise

to sharp though sometimes transient earache, or it may end in an *otitis media*. Earache in a child calls for the examination of the naso-pharynx. Where the hypertrophied process is confined to Luschka's tonsil, there may be considerable increase in its size without hearing being affected.

(8) *Deformity of Palate*.—The development of the superior maxillæ may also be arrested. The result is a highly arched narrow palate with an irregular arrangement of the teeth.



FIG. 39.—A highly-arched, narrow palate with irregular teeth, which are crowded together. This deformity is usually caused by obstruction to nasal respiration during the years of development, and is frequently due to the presence of post-nasal adenoids.

(9) *Bleeding*.—A child with adenoids may have bleeding from the nose, but more frequently there is a small quantity of blood in his mouth in the morning, or the pillow on which his head has rested may be stained with blood and saliva.

(10) *Aprosexia*.—Guye, of Amsterdam, first called attention to the impairment of the cerebral function due to disorders of the nose and naso-pharynx. He found that headache was frequently the result of nasal obstruction, and next in frequency from the same cause was the inability to fix the attention on any definite more or less abstract subject. This latter condition or symptom he called *aprosexia*. His explanation of this cerebral symptom of exhaustion as resulting from nasal disorders is as follows:—"Cerebral exhaustion must be the consequence of one or two causes, either the nutrient matter which has to repair the loss produced by the function of the brain is not yet sufficiently procured or assimilated, or the products of the 'tissue-change' which have to be eliminated, are incompletely removed. This removal will, according to physiological principles, have to take place partly at least by means of the lymph vessels; and in this respect we must point to the fact found by Axel-Key and Retzius, that large lymph vessels leave the cerebral cavity together with the fibres of the olfactory nerve. It is highly probable that structural changes in the nasal mucous membrane, and especially such as will exert pressure on the lymphatics, will impair or prevent the current of the cerebral lymph through the nasal mucous membrane. The retention of the products of the chemical processes in the tissues of the brain will lead to results which we may expect to be the same as those of physiological exhaustion, that is, of fatigue."

Allusion has just been made to the vacant appearance of the face in those the subjects of post-nasal adenoids, who are of necessity "mouth-breathers," but in addition to the

look of stupidity which they wear, the children are usually stupid and backward in everything calling for mental effort, and aprosexia is a marked feature in most cases. Ferrier says that intelligence is proportionate to the development of attention, and it is also proportionate to the development of the frontal lobes. The frontal lobes are imperfectly developed in idiots, whose power of attention is very weak; and removal of the frontal lobes does not induce motor paralysis, but merely mental degeneration, resulting in loss of attention. Now, anything interfering with the due nourishment of the frontal lobes will interfere with their function, and Guye's theory regarding the mechanical obstruction to the exit of waste material from the frontal region of the brain may, as it is the simplest, be the true explanation. Where, however, this mechanical obstruction, causing lymph-stasis, has existed for years, would we not expect organic changes in the brain to result? Reasoning from symptoms, we must conclude that this does not occur, for almost immediately after the complete removal of post-nasal adenoids, even in cases of some years' standing, aprosexia becomes a thing of the past. In illustration of this important fact, one of Dr. Guye's own cases, the first in his original communication, may be quoted. "On examination I found complete nasal obstruction, and the boy, who had been to school for a year, had not been able to learn more than the first three letters of the alphabet. I removed a mass of adenoid tumours from the naso-pharyngeal cavity, and when his father brought him again, a week later, he told me that his son had learned the whole alphabet in that week." But there may be another explanation, and one which I advanced some years ago, based on the mechanism of attention.

The general mechanism of attention is motory, and in the particular case of voluntary attention it chiefly consists of an action of inhibition. Everyone knows by experience

that voluntary attention is always accompanied by a feeling of effort, which bears a direct proportion to the duration of the state and the difficulty of maintaining it. If this feeling of effort be carefully analysed, it will be found that it coincides with a fixation of the muscles of the chest, a closure of the glottis, and an active contraction of the muscles of respiration. During voluntary attention, which is a momentary state of the mind, respiration is suppressed or inhibited. Where, however, respiratory difficulties are present, the ability to fix the attention is difficult or impossible, according to the degree of obstruction, because there is not that reserve of air in the lungs, necessary for purposes of the economy, to permit of a period of inhibition or short cessation of the respiratory act. The removal of the post-nasal obstruction, by permitting of free respiration and the more complete oxygenation of the blood, renders the inhibitory action, necessary to voluntary attention, possible.

Guye's theory is that which is generally accepted, but if interference with the lymphatic circulation was wholly responsible for this symptom, it should, reasoning from the results of lymph-stasis seen elsewhere, result in organic changes, which, as has been said, do not appear to occur even in cases of long standing. The rapidity with which the power to give attention returns, after the respiratory tract has been made free, favours, I think, the explanation suggested by me.

When adenoids are present in the adult, the symptoms are somewhat similar to, though usually less marked than, those enumerated. The anterior nares are narrow, and there is a degree of nasal obstruction; there is dulness in hearing, sometimes with tinnitus, and a chronic pharyngitis with a tendency to laryngeal catarrh.

Diagnosis.—In a typical case the diagnosis is easy; the open mouth and the narrow nares, with the history of snoring at night and dulness in hearing, point to the

presence of adenoids. Corroboration of the opinion may be obtained by the use of the post-rhinoscopic mirror, or by palpation of the naso-pharynx.

(a) *Inspection.*—The naso-pharyngeal space is readily inspected in the adult, and growths, if present, may be demonstrated by the use of an ordinary laryngeal mirror of

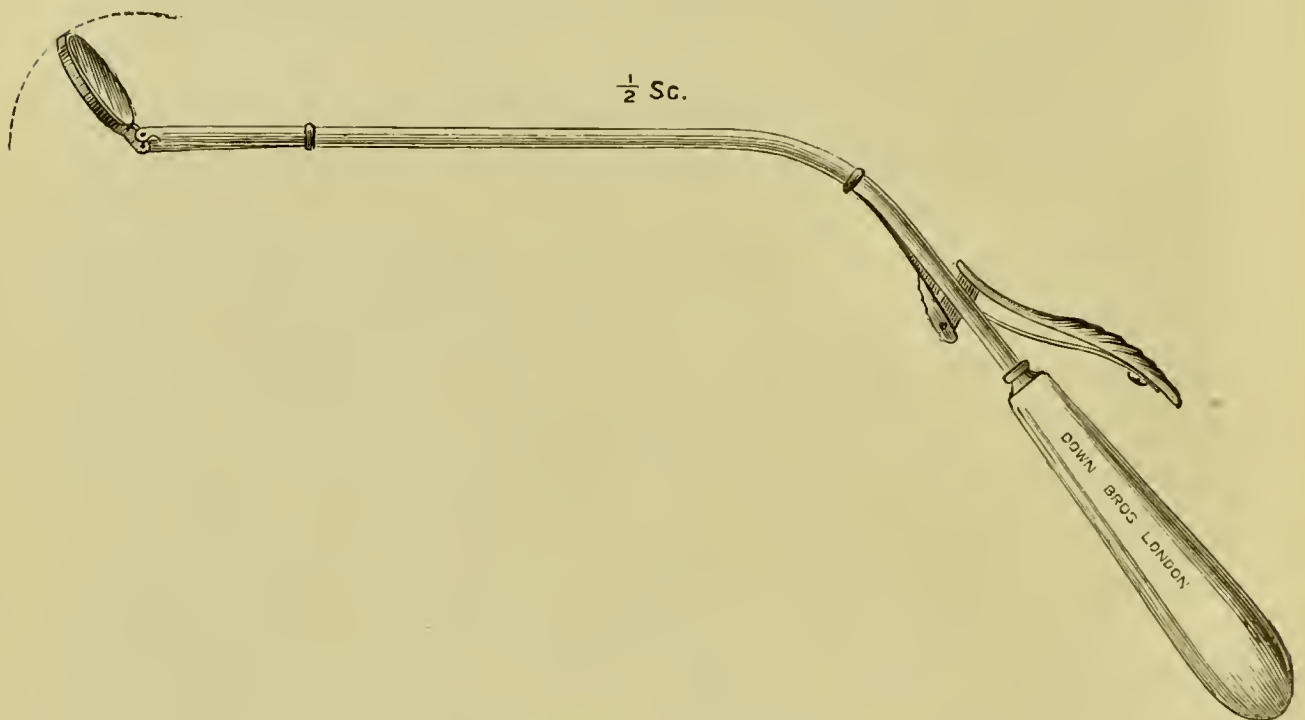


FIG. 40.—Michel's mirror for posterior rhinoscopy.

medium size, or, and better, by means of a rhinoscopic mirror, which is one so constructed that the angle at which the reflecting mirror meets the stem may be altered at will. Of these mirrors Michel's and Fränkel's are the best known.

The patient sits in the upright position, the mouth is opened, and the tongue is gently pressed towards the floor of the mouth by means of the depressor. Should there be any difficulty in viewing the naso-pharynx, the soft palate may be gently drawn forwards by means of a palate retractor. The illustration shows White's self-retaining instrument, by means of which the palate may be held in any desired position, leaving the surgeon's hands free.

The mirror having been warmed is introduced into the mouth with the reflecting surface uppermost, and as it is passed behind the soft palate, the posterior aspect of that structure is brought into view. When the mirror is almost in contact with the posterior wall of the pharynx, it will be observed that the space above contains an irregular lobulated swelling which projects forwards towards the posterior nares. It may be bright red in colour, though usually it is pale and

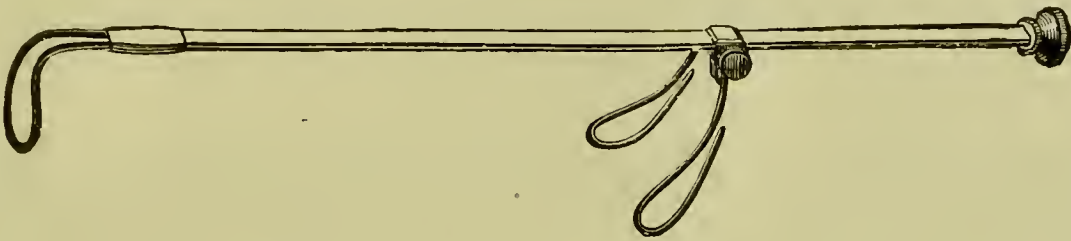


FIG. 41.—White's palate retractor.

resembles flabby granulation-tissue, and it may be small or large, but on account of the angle at which it is viewed, the mass rarely appears so large as it is in reality.

This method is less easily applied in the case of children, yet with patience the space and its contents can be viewed satisfactorily in a large proportion of cases.

(b) *Palpation*.—Where inspection fails and the diagnosis is uncertain, the naso-pharynx may be explored by means of the forefinger. For this purpose the surgeon, standing at the right side of the patient, who is seated, passes his left arm behind the patient's head, and when the patient's mouth is opened his cheek is pressed in between the teeth by the left thumb or forefinger. This obviates the risk of the surgeon's finger being bitten.

The surgeon then introduces his right forefinger into the patient's open mouth, and, directing it well backwards and downwards to the edge of the soft palate, curves the point of the finger around its free border and thus up and into the naso-pharyngeal cavity. A beginner frequently fails to enter the cavity, as he invariably pushes a portion of the soft palate backwards and upwards in place of getting the finger

beyond its free edge before directing it upwards. In order to explore the space fully it is necessary to stretch the angle of the mouth, gently of course, as far as the second or third molar, and the necessity for this precludes the employment of a gag. As the finger enters the space, adenoid growths, when present, are readily recognised, but the important point is to ascertain the extent of the hypertrophic process. To this end, as soon as the finger is passed behind the soft palate, it should be directed forwards, and the posterior nares, with the structures immediately within their boundaries, sought for: then, on either side the rounded border or cushion of each Eustachian tube is felt. Having made out those landmarks, the position and extent of the hypertrophied tissue, situated on the posterior wall, or in the vault of the pharynx, can be accurately ascertained, the character of the tissue recognised, and the necessary means of treatment decided upon.

On withdrawing the finger, it may be covered with blood, for adenoids bleed readily, or a small portion of the friable adenoid tissue may be adherent to the finger-nail.

Meyer has described the sensation conveyed on pressing the finger into those soft vegetations as like "pushing the finger into a bunch of earth-worms." When speaking to students on this subject, I am in the habit of comparing the sensation to that which one experiences in thrusting the finger into the substance of a rapidly growing sarcomatous tumour, *pushing one's way into friable tissue where the resistance to the progress of the finger is of a comparatively slight character*. This comparison is the more valuable in that any student may, in the operating room, after such a tumour has been removed, familiarise himself with those sensations and acquire the knowledge more readily than by poking amongst collections of earth-worms.

In making the diagnosis, one must exclude mucous polypus, hypertrophy of the posterior ends of the turbinals,

post-pharyngeal abscess, and abnormal prominence of the bodies of the upper cervical vertebræ.

Prognosis.—Where the adenoid mass is large, and the resulting symptoms are pronounced, the improvement in the child's condition and comfort which follows its complete removal is very marked, and is fully appreciated by the parents. If in similar cases the obstructing mass is not removed, either on account of neglect or from an aversion to operation, it will in all probability, as time goes on, slowly become atrophied, and at the age of puberty it will have become shrunken, or may have wholly disappeared. But even though its disappearance was a certainty, the child will suffer the discomforts associated with adenoids through a long series of years, and the ill-effects will remain. The "adenoid facies" persists, the nares remain narrow, hearing may be permanently impaired, and the deformity of the chest-walls cannot then be remedied. If the adenoids be thoroughly removed, and the child is subsequently taught the method of nasal respiration and the use of the pocket-handkerchief, recurrence is most unlikely.

Where those directions cannot be followed, as in children under three years of age operated upon, on account of the urgency of their symptoms, the probability of recurrence is increased. What is sometimes spoken of as recurrence, however, is often the result of neglect after operation. Mucus is allowed to collect in the naso-pharynx, where it covers the raw surface and favours the formation of granulation-tissue.

Treatment.—It must be borne in mind that every child who may display some of the symptoms which have been enumerated does not of necessity have adenoids, nor must operation be contemplated until the state of the nose and naso-pharynx has been ascertained by careful examination. Where there is a general swelling of the lining mucosa of the nose or naso-pharynx, local medication may be employed to allay the swelling and remove the symptoms.

On the other hand, where hypertrophy of the adenoid tissue is present in young children, and, by obstructing nasal respiration, affects speech and sleep and possibly hearing, then its removal by operation is the most direct and the quickest way to restore the patient to comfort, to permit of normal nasal respiration, and to prevent complications in the future.

Anæsthetic.—Post-nasal adenoids in an adult may be removed satisfactorily with the help of a local anæsthetic, but in dealing with children it is both cruel and most unsatisfactory to attempt their removal without general anæsthesia. When adenoids alone are to be operated upon a short anæsthesia may suffice, such as may be induced by the use of chloride or bromide of ethyl, or nitrous oxide gas alone or combined with oxygen. But where the tonsils are also hypertrophied, and their removal is called for, then chloroform is the best anæsthetic. Ether is most unsuitable for this operation, as it stimulates the flow of mucus in the mouth and pharynx, it causes cyanosis, and thereby increases hæmorrhage. If the child is properly prepared for chloroform its use is eminently safe, and by it the anæsthesia can be controlled and prolonged when necessary, so that there need be no hurry in the performance of the operation. Personally I use chloroform in all cases, with the rare addition of a small proportion of ether when dealing with weakly children, and I insist on having the child fully anæsthetised. It is most easily administered by the continuous dropping of the chloroform on an open mask, or on a single layer of a towel folded and gathered into the form of a mask, by which both the nose and the mouth are covered.

Instruments.—The instruments by which post-nasal adenoids may be removed may be divided into three categories according to their uses :

- (1) Curettes or scraping instruments.
- (2) Ring-knives or cutting instruments.
- (3) Sharp-edged forceps or biting instruments.

Curettes.—The finger-nail was the first form of curette employed, and for a time it was the only instrument used for the removal of adenoids. But it was soon observed that, in a large proportion of cases so operated upon, the symptoms were relieved but temporarily, and even in young children, where the gland is particularly soft, it was seen that, while the friable portion of the gland was removed by the finger-nail, the firmer fibrous tissue remained. The human nail was then replaced by a steel nail devised by Lennox Browne. This was worn like a thimble on the terminal phalanx of the forefinger, beyond the tip of which the scraping portion projected. But the thickness and relative shortness of the forefinger interfered with the useful application of the steel nail. Other scraping instruments were introduced in quick succession, Hartmann's and Myers' being the better known models, but they are rarely used now.

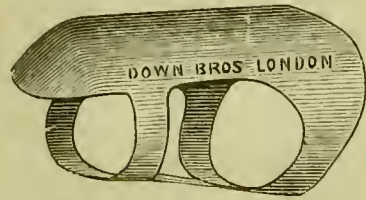


FIG. 42.—Steel nail or scraper.

Ring-Knives.—Gottstein's ring-knife is the model on which the favourite forms of cutting instruments are shaped. The pattern by which the adenoid mass can be

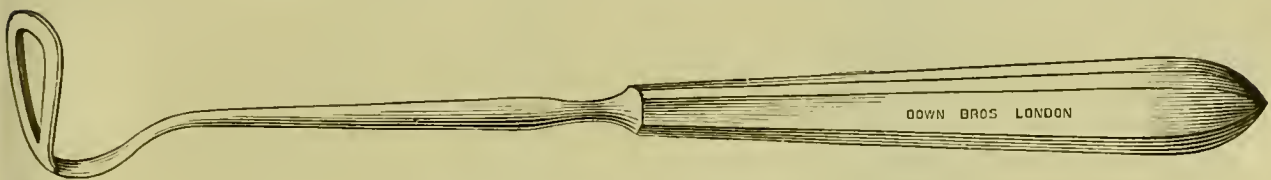


FIG. 43.—Gottstein's ring-knife.

most completely removed, and in one piece, is the modified Gottstein here figured with the Delstanche cage, which latter contrivance serves to grasp and hold the gland after it has been separated from the pharyngeal wall.

The cutting edge may be directed downwards as in the early form of Gottstein's ring-knife, or it may be set obliquely downwards and backwards. The former pattern is most useful when the hypertrophied tissue is limited to

the back wall of the pharynx, as it sometimes is in adults. But where the growth springs from the roof as well as

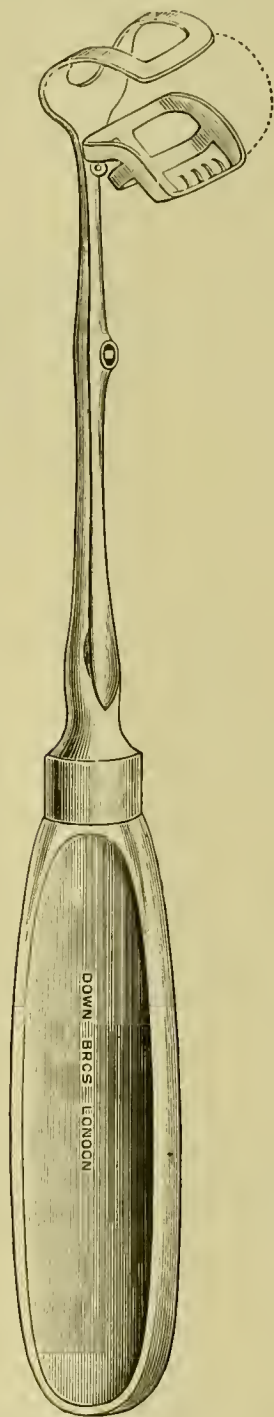


FIG. 44.—St. Clair Thomson's adenotome.

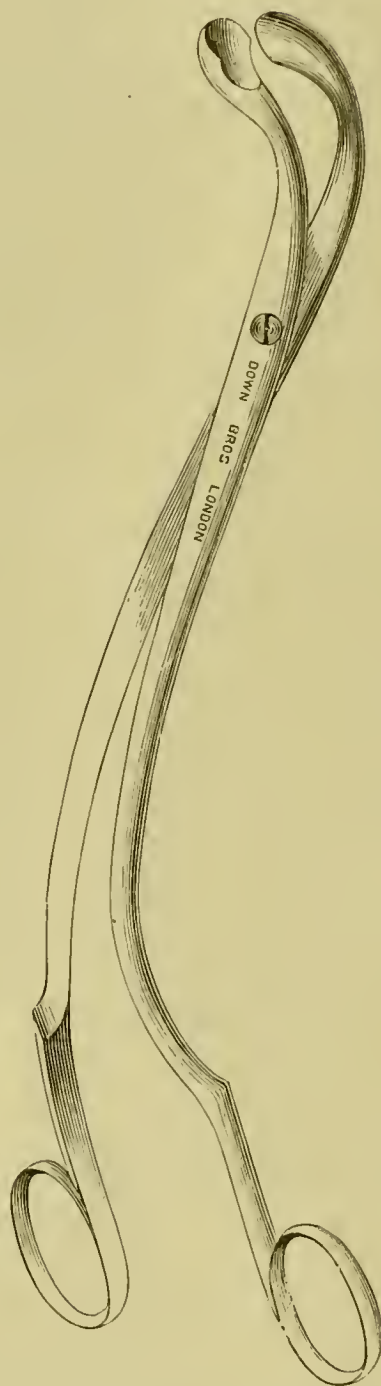


FIG. 45.—Lowenberg's forceps.

from the posterior wall of the naso-pharynx, the instrument with the knife set obliquely enables the surgeon to cut the adenoid mass from the roof and the posterior wall with practically one sweep of the knife.

Forceps.—By means of forceps adenoids are removed piece-meal. The sharp edges of the forcep-blades may simply meet, and thus cut or bite off the portion of gland tissue caught between them: or they may be in the form of punch-forceps. Lowenberg's forceps were those first devised for this operation, and since their introduction there have been many modifications and improvements in their shape and mode of action.

When removing adenoids with forceps, the latter should be held like scissors in the right hand, and the left forefinger should be placed in the naso-pharynx to guide the blades to the part to be removed. Without this guidance serious damage may be done to neighbouring structures, particularly to the nasal septum.

The operation of removal of adenoids by forceps is slow, and tags of tissue are apt to be left, so that those who use them frequently complete the operation by the use of the curette or ring-knife.

The Operation.—While the exact position of the patient during operation varies with the ideas and the dexterity of the surgeon, it may be said that when gas or a local anæsthetic is employed, the patient may sit upright in a chair; but where a general anæsthetic is used the child must be placed in the prone position. My own method is to have the child anæsthetised while he lies on his back on the operating table, with his head resting on a pillow. When the child is anæsthetised, the mouth is held widely open by means of a gag, which the anæsthetist may hold in position, with his left hand.

Light is then reflected on to the fauces, and the tonsils, if enlarged, are excised. The tonsil is encircled by the ring of the guillotine; then it is deliberately transfixed by the fork, and the knife having been released is pulled forwards and the tonsil is removed. The other tonsil is similarly dealt with, and then a sponge on a holder, with a sprinkling of

tannic acid over its surface, is pressed firmly against each raw surface, by means of which bleeding is quickly checked.

Next, the right forefinger is passed into the naso-pharynx, and the size and extent of the hypertrophied tissue is ascertained. If the mass be a large one it may be found to extend from the roof of the naso-pharynx downwards almost to the level of the palate.

The modified Gottstein-Delstanche or St. Clair Thomson's adenotome is then taken and held firmly in the right hand like a dirk. It is passed behind the soft palate and carried up to the vault of the pharynx. When in this position, it

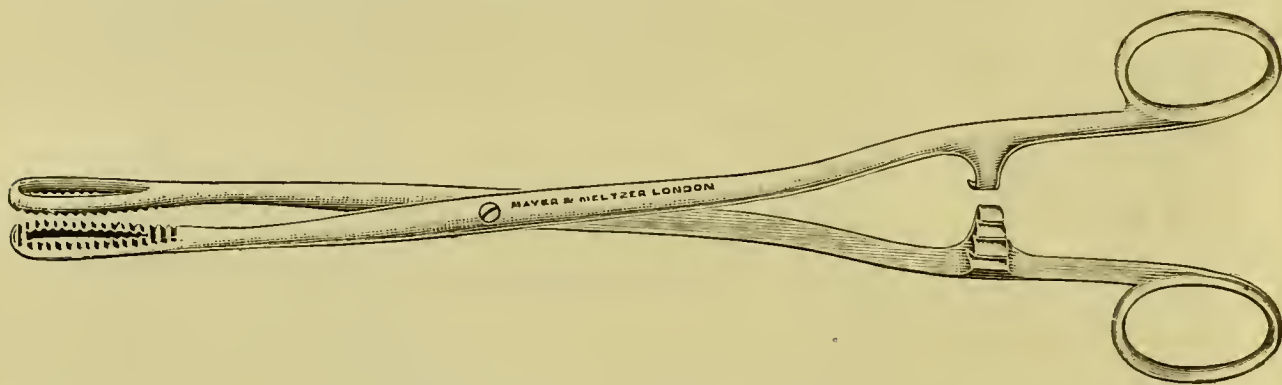


FIG. 46.—Sponge holding forceps.

is pushed directly backwards two or three times in quick succession, by which manœuvre the upper border of the adenoid mass is stripped from the vault; then the instrument is firmly pressed backwards against the posterior wall, and slowly brought downwards, following the curve of the naso-pharynx. In doing this the surgeon's hand is raised as the cutting edge descends. The instrument is then withdrawn, and the whole mass is brought with it, held by and projecting from the cage.

Immediately this has been done the patient's head is extended over the end of the table, or the head-piece of the table is lowered, so that the blood may escape through the nares. I then take a strip of sterilised gauze three or four-fold in thickness, and carrying it over the point of the right forefinger, pass it through the mouth and into the naso-

pharynx. By the gauze-covered finger I scrape away any tags of adenoid tissue which may have been left, together with any hypertrophied gland tissue situated around the posterior choanæ or in Rosenmüller's fossæ, leaving the wall of the naso-pharynx perfectly smooth. A sponge, with a thin coating of tannic acid and fixed to a curved sponge-holder, is then passed into the naso-pharynx, by means of which bleeding is quickly arrested. Much has been written in condemnation of the use of sponges on account of the bruising which is said to follow their use after this operation. In my experience it is at no time of any moment, but on the other hand, bleeding, by their application after this fashion, is quickly arrested, and the risk of blood entering the trachea is eliminated.

After-treatment.—Having recovered from the anæsthetic the child should be put to bed with the head on a level with the body, so that any blood which may further ooze from the raw surfaces may escape through the nose or enter the mouth. Some hours later a pillow may be supplied.

A few sips of warm tea given half an hour after the operation often relieves the headache and the general discomfort following the use of the anæsthetic, and it helps to remove the soreness in the throat. The latter may be further soothed and the raw surface kept clean by the use of marsh-mallow or formamint lozenges.

The parent should be warned that on recovering the child may vomit some blood, swallowed during the operation.

The nurse should be instructed to teach the child the use of the pocket-handkerchief; the nose should be frequently cleaned by blowing during the first few days after operation, and the child should be encouraged to practise breathing through the nose while under the close supervision of the nurse. Douching with watery solutions after the operation is harmful, and spraying with astringents and antiseptics is only called for in exceptional circumstances.

I have found it advantageous to give one teaspoonful of the following mixture, three times a day for one week after operation.

Rx Acid. Hydrochlor. dil.	℥ 72.
Essentiæ Pepsinæ	ʒvj.
Glycerine	ʒss.
Aquæ <i>ad</i>	ʒiij. M.

It acts as an astringent and keeps the surfaces clean, and it aids in the digestion of any blood which may have entered and been retained in the stomach.

Possible Complications.

(1) **Hæmorrhage.**—The removal of adenoids is immediately followed by free bleeding, which, however, can be checked within a few seconds by the quick and firm application of sponges as already described. But even without their application bleeding soon ceases spontaneously.

Where the ascending pharyngeal artery, or the internal carotid is abnormal in its course, there is the possibility of injury to either vessel during the operation; but I am not aware of any case of this kind having been recorded. Free hæmorrhage is more likely to occur in bleeders, and the only instance of dangerous bleeding which I have had to deal with was in a child who, I afterwards learned, had on one occasion bled most profusely after the extraction of a tooth. The bleeding in this case was checked by packing the naso-pharynx firmly with strips of sterilised boric lint, dusted over with tanno-gallic acid powder. From the formation of the space and the nature of its walls, bleeding from the naso-pharynx can always be controlled by firm packing on those lines.

(2) **Otitis Media.**—An acute inflammation of the middle ear may follow this operation. Inasmuch as the presence of adenoids is a frequent cause of middle ear catarrh, the child,

at the time of operation, may have, though unobserved, a chronic otitis media, and an acute exacerbation may follow the operation. To prevent this complication as far as may be possible, the operation should not be performed while the patient is suffering from a cold in the head.

(3) **Septic Infection.**—If the operation be carried out with the precautions necessary in the performance of any surgical operation, if the adenoids are removed completely, and the patient is put to bed in a healthy well-aired apartment, there is little to fear. Where, however, the operation is hastily performed, or where some loosely attached tags of tissue are left, sepsis may result. Insanitary surroundings may also exert a prejudicial influence on the healing process.

(4) **Fever.**—If the blood swallowed during the operation is not got rid of by vomiting, the temperature may rise within 24 hours, but the administration of an aperient will quickly remove the cause, and the temperature will fall.

(5) **Paresis of the Palate.**—Following the operation, the patient's speech may be 'nasal' in character, which may be due to swelling of the soft palate, consequent on bruising or other injury during the operation; or it may be a paresis from bruising or from sepsis. In either case the condition will pass away satisfactorily.

CHAPTER X.

ACUTE INFLAMMATIONS OF THE LARYNX.

ACUTE LARYNGITIS.

LARYNGITIS in an acute form may be of catarrhal origin ; it may be the result of injury ; it may be due to the action of some specific organism ; or it may appear in the course of some constitutional disease.

(1) **Acute Catarrhal Laryngitis.**

Etiology.—This affection is usually catarrhal in origin, and in the majority of cases it results from extension downwards of an acute naso-pharyngeal catarrh, which, by still further extension, may terminate in bronchitis. It may, however, originate in, and be confined to, the larynx.

Among the **predisposing** causes are nasal obstruction, which makes mouth-breathing a necessity ; occupations of a sedentary character performed in a heated or impure atmosphere ; and the gouty and rheumatic diatheses.

The **exciting** causes are chiefly exposure to cold winds and wet, inhalations of irritating fumes, and the excessive use of alcohol. It is of frequent occurrence during epidemics of influenza, and laryngitis sometimes occurs in the course of measles and the specific fevers.

Symptoms.—The severity of the symptoms depends largely on the degree of the local inflammation.

In the milder forms **in adults** there is usually a dry, tickling cough, with a varying degree of hoarseness, and the tone of the voice is deeper than usual. There is a sense of rawness, bordering on pain, in the region of the larynx, which is aggravated by the use of the voice. In more severe cases those symptoms are intensified; the coughing may be incessant, “croupy” in character, and sharply painful; there is a feeling of constriction at the upper part of the wind-pipe, especially on exertion. Respirations are increased in frequency; both inspiration and expiration may be accompanied by a sibilant sound, while in other cases the breathing may be noisy and stridulous in character, according to the degree of swelling within the larynx.

At first the cough is dry and unaccompanied by expectoration, but later clear tough mucus, small in quantity, and sometimes, though rarely, streaked with blood, will be coughed up. When resolution sets in, the secretion becomes greater in quantity and muco-purulent in character; and if the inflammatory process has extended to the trachea or bronchi, the expectoration is abundant and frothy. In the early stages there is slight elevation of temperature, increase in the pulse-rate, and general restlessness.

Acute laryngitis **in children** is of much more serious import than in the adult. In the child the glottis is small, spasm is easily excited, and œdema occurs readily; thus dyspnœa is apt to occur at an early stage in the inflammatory process in the child.

In a child the first symptom may be a “croupy” cough, slight hoarseness, with slight elevation of temperature. During the night a child so affected may suddenly wake up with crowing respirations and in a state of great distress. The cause of the respiratory difficulty may be threefold:

œdema over the arytenoids, of the ary-epiglottic folds, of the ventricular bands, or in the subglottic region; **spasm** of the vocal cords; and the presence of tough **mucus** within the larynx.

This state was formerly described as a variety of **croup**. The dyspnœa may quickly pass off, or it may persist for many hours.

On **laryngoscopic examination** the laryngeal mucous membrane will be found to be deeply injected. The vocal bands may remain somewhat pale, or they may be irregularly injected, but when the inflammation is severe, they may be bright red throughout their length, dry on the surface, and rounded. On attempted phonation they do not meet throughout their length on account of their swollen condition, so that a space, elliptical in form, remains between them. The ventricular bands, besides being deeply injected, may be swollen to such an extent as to obscure the greater part of the vocal cords from view.

Acute catarrhal laryngitis is occasionally **complicated** with œdema, though œdema is more frequently seen when the inflammation is the result of scalding, or where it is associated with tubercular or syphilitic ulceration, and in cases where there is necrosis of cartilage from any cause. When œdema is present, the symptoms referable to respiration and deglutition become more severe. When it involves the epiglottis, deglutition is both painful and difficult, and when the ary-epiglottic folds and the ventricular bands are swollen, dyspnœa may be so severe as to threaten suffocation. The epiglottis, when œdematous, may retain its general form, but with a considerable increase in its thickness, or it may assume the form already described as somewhat resembling the *os uteri* in appearance. When the ary-epiglottic folds are œdematous, they appear as two globular swellings posteriorly, and their presence prevents the interior of the larynx being fully inspected. Where the œdema is the

result of an acute catarrhal inflammation, the folds are usually affected equally, but when it is due to other causes, the swelling is frequently limited to one side, or if both sides be œdematous, they are not equally so.

With the laryngoscope, red patches, the result of sub-mucous hæmorrhages, may be observed, and there may be actual bleeding points on the surface. This rare condition has been described as *laryngitis hæmorrhagica*, and appears to be met with chiefly in those who, while the general health is low, contract an acute inflammation of the larynx.

Diagnosis.—From the history of the illness and by laryngoscopic examination, the diagnosis of acute catarrhal laryngitis in the adult is easy. There is greater room for doubt in the case of a child.

Acute catarrhal laryngitis, occurring in a child, is very apt to be mistaken for laryngeal diphtheria. The cough, however, in true croup, is husky as compared with the loud clanging so-called “croupy” cough of laryngitis, and the voice in laryngitis is comparatively clear and deep in tone, while in the diphtheritic form it is always husky. The simple catarrhal condition tends to improve, if there be no complications, almost from the time of its first appearance, while in true croup the symptoms continue to increase in severity. Where examination of the parts with the laryngoscope is possible it should be employed, as by this means the presence or absence of membrane in the larynx may be determined, and doubt in the diagnosis removed.

Prognosis.—In the adult, simple acute catarrhal laryngitis usually runs a favourable course of comparatively short duration; and even in the very severe cases where œdema is a marked feature, accompanied as it will be by symptoms of severe respiratory distress, recovery will follow the use of appropriate treatment in almost every case.

The attack may be followed by a varying degree of hoarseness, particularly where the voice has not been

rested during the acute stage of the illness; or there may be loss of tone of the muscles consequent on the acuteness of the inflammatory process, leading to impairment of the voice.

Acute catarrhal laryngitis in children is of more serious import, and the younger the patient the greater is the danger. The child's larynx is small, the glottic chink is narrow, and the tendency to spasm is great, so that sudden and serious dyspnœa may readily supervene, and, if unrelieved by operation, it may prove fatal.

Treatment.—In all cases of acute laryngitis the patient, whether child or adult, should be confined to bed, and the larynx should be given as complete rest as is possible. The voice should not be used, and any irritation which excites coughing should be soothed.

In the case of **children**, in whom gastric disturbance is frequently associated with acute laryngitis, treatment is best begun by the administration of a sharp emetic. For this purpose ipecacuanha wine with sulphate of zinc is most effective.

℞ Zinci Sulphatis ʒj.
Vini Ipecacuanhæ ʒj. Solve.

A teaspoonful should be given every ten minutes until emesis is produced, and between the administration of each dose the child should be encouraged to drink freely of warm water.

Following emesis, the *Liquor ammonia acetatis* or *citratiss* may be given in doses of one drachm every two or three hours until the skin acts freely. As an alternative Dover's powder (*Pulv. ipecac. co.*) may be given in small and frequently repeated doses, and this is specially useful in cases where the cough is troublesome.

Locally, in the early stage, ice may be applied over the larynx; but later, and particularly if there be œdema or

any tendency to spasm, much relief will be obtained from the application of hot fomentations around the neck, and from the inhalation of steam.

The good effect of a fly-blister applied over the larynx in a child with stridulous breathing due to acute catarrhal laryngitis is sometimes very marked.

In those cases where suffocation seems imminent on account of œdema glottidis or prolonged spasm, intubation or tracheotomy must be performed.

In **adults** an emetic is often wonderfully effective in cutting short the attack. If this is not used, then treatment should be begun by the administration of a purgative, such as calomel, followed by a saline.

Ice applied over the larynx, with ice to suck, sometimes relieves pain and irritation, and checks the further progress of the inflammation; but hot moist inhalations, either of steam alone or of steam medicated by the addition of a volatile sedative, such as Vapor conii, Vapor lupuli, or Tinct. benzoin. co., are most soothing and beneficial.

Where difficulty in breathing is experienced, a mustard leaf, used as a rubefacient, or a fly-blister, may give the desired relief; and in cases where the inflammation has spread to the bronchi, much comfort may be given by applying hot poultices, or by the application of menthol preparations over the upper part of the chest.

Internally, 10 grs. of Dover's powder with 10 grs. of nitrate of potash may be given each night; and 10 grs. of sodium salicylate with two drachms of the Liquor ammoniæ acetatis every three hours throughout the day.

When the cough is troublesome pastilles containing cocaine, ipecacuanha, menthol, morphia, or heroin may relieve the laryngeal irritation, and further ensures rest to the inflamed parts.

When œdema of the epiglottis, of the arytenoids, or of the ary-epiglottic folds interferes seriously with respiration,

the fulness may be reduced by pricking the surface of the affected part with the point of a laryngeal lancet. Subglottic œdema, which occurs more rarely, usually subsides under the influence of inhalations of medicated steam; but, should it increase to the extent of causing serious dyspnœa, the trachea should be opened.

(2) Acute Congestive Laryngitis.

An acute affection of the larynx, of a less severe character, is frequently met with in public speakers and vocalists, to which I have given the name of acute congestive laryngitis. It is usually spoken of as a catarrhal lesion, but while it may in some instances be associated with catarrh, it is in most cases the direct result of misuse of the voice.

Etiology.—Among the causes may be noted, preaching or singing while suffering from a cold in the head: straining the voice, as may occur in singing or speaking in an overheated, vitiated atmosphere: by shouting on the stage, in a noisy workshop, or on the street, and by addressing a large audience in the open air, especially at a noisy street corner.

Symptoms.—The symptoms vary from hoarseness to aphonia, and pain is rarely a prominent feature of the disorder.

Diagnosis.—The resulting condition is not so much an inflammation as a congestion, affecting the vocal cords specially. The cords may be deeply injected and slightly swollen, and their movements may be impaired, adduction on phonation being incomplete. The surrounding parts are not affected to any extent, and œdema, so frequently seen in acute catarrhal laryngitis, does not occur.

Prognosis.—With prompt treatment, complete recovery of the vocal function is the rule.

Treatment.—Rest for the voice, when it can be obtained, is advantageous, and should be encouraged; but this is not always possible, particularly in the case of actors and vocalists with nightly engagements. In their case much help will be obtained from the frequent spraying of the interior of the larynx with equal parts of solution of adrenalin chloride (1–1000) and camphor water. Where the vocal cords are much swollen, the careful application, by means of a small curved camel-hair pencil, of a two per cent. solution of silver nitrate over the laryngeal mucosa, after the surface has been anæsthetised with cocaine, is frequently followed by a rapid beneficial result. In addition, a medicated steam inhalation should be used for five minutes each night on retiring.

(3) Traumatic Laryngitis.

An acute inflammation of the larynx may be excited by the accidental application of caustics to the interior of the larynx, by the entrance of a sharp foreign body into the larynx, by the drinking of boiling water or hot tea from the spout of a kettle or tea-pot, by the drinking of caustic solutions, in mistake for some beverage, or with suicidal intent, or by the inhalation of powerfully irritating fumes from chemicals.

Where the injury is caused by the drinking of hot or caustic fluids, the gullet usually suffers to a greater extent than does the larynx; and in some cases the lip of the epiglottis and the arytenoid prominences may be the only parts of the larynx involved, while the walls of the gullet in the same case may be extensively involved.

In other cases, and particularly in **children**, the accidental swallowing of a hot fluid may be quickly followed by an acute inflammation of the laryngeal mucosa, accompanied by œdema, so that, within a few hours of the accident,

alarming dyspnœa, with danger of immediate suffocation, may supervene.

In **adults** a fibrinous exudate forms on the parts which have been touched with the caustic fluid on its passage towards the gullet, giving rise to one form of membranous laryngitis.

Treatment.—Where the inflammation is due to the presence of a foreign body, it generally subsides on the removal of the latter, though sepsis may follow the impaction of a bone.

Where the process results from scalds, burns or corrosive substances, the application of emollients such as olive oil, warm milk or cream, are soothing.

(Edematous swellings may be reduced in size by puncturing the swollen surface with a laryngeal lancet, but when dyspnœa from œdema is severe, tracheotomy should be performed.

(4) **Membranous Laryngitis.**

An inflammation of the larynx, accompanied by the formation of a membranous exudation, may be caused by (*a*) the introduction into the larynx of caustics or irritants, or by scalding; (*b*) by a streptococcic infection; and (*c*) by the Klebs-Loeffler bacillus.

Much has been written regarding the differentiation of membranous croup and laryngeal diphtheria, but the safe course to pursue in all cases of membranous laryngitis, other than those the result of trauma, is to treat them as cases of true diphtheria, and to act promptly.

CHAPTER XI.

CHRONIC INFLAMMATIONS OF THE LARYNX.

LARYNGITIS may occur in a chronic form as a manifestation of syphilis, tuberculosis and other general diseases, and the local lesion will be referred to when these affections are under consideration. Here the chronic catarrhal affections alone will be dealt with.

In some cases chronic laryngeal catarrh may result in nothing more than a persistent general injection, with consequent swelling of the mucosa, when it is described as **chronic catarrhal laryngitis**. In other instances it leads on to definite tissue-changes, and the intra-laryngeal conditions which result may, for purposes of description, be grouped according to the nature and position of the tissue-change, thus—**pachydermia laryngis**, **subglottic hyperplasia**, **chorditis tubercosa** or singer's nodules, and **laryngitis sicca**.

(1) Chronic Catarrhal Laryngitis.

Etiology.—This may follow an acute catarrhal laryngitis, and is particularly liable to occur where, during the acute stage, or during convalescence, the voice has not been rested. In other cases it is not preceded by an acute inflammation, but comes on gradually, and is then usually associated with chronic pharyngitis. This is most apt to occur in those

whose calling necessitates the prolonged use or the straining of the voice, and where the working day is spent in a dusty or otherwise impure atmosphere. It may be caused, and is always aggravated, by any condition which necessitates mouth-breathing, for in those cases the inspired air is neither properly warmed, moistened, nor purified, as it is when it passes over the healthy nasal mucous membrane. A like result may follow in patients suffering from atrophic rhinitis. Excessive smoking, the regular use of alcohol, and chronic dyspepsia, are often determining factors in its genesis. It is more common in adults than in children, and is much more frequently met with in males than in females. Persistent laryngeal catarrh occasionally precedes laryngeal and pulmonary tuberculosis. So when this occurs in association with marked anæmia of the mucosa, the lungs and the expectoration should be carefully examined.

Symptoms.—The chief subjective symptoms are a sense of dryness and irritation in the throat, with persistent huskiness, or it may be aphonia, and a constant desire to clear away the cause of the huskiness by hawking. These symptoms are intensified by the use of the voice, and the resulting discomfort, and actual pain in some cases, is so great that the patient speaks no more than is absolutely necessary. In other cases, even slight exertion of the voice produces a painfully tired feeling in the larynx. The patient in describing the state of his vocal function usually says that on rising in the morning he is husky, or has aphonia, and has the inclination to cough frequently; but after partaking of a warm breakfast, the voice becomes comparatively clear, though it is readily tired on exertion, when hoarseness again may supervene, and attempts on his part to clear it rather add to, than relieve, the huskiness.

In the hyperplastic forms, and particularly where there is a bulky inter-arytenoid swelling, a varying degree of dyspnoea may be complained of.

On **examination** it will be found that the appearance of the parts varies according to the cause and the chronicity of the case. When of comparatively recent origin there is general fulness, the lining mucous membrane is deep red in colour, the surface is dry, and scattered over it are patches of tenacious mucus, which, by adhering to the free borders of the cords, may stretch over the glottis like a web. In other cases the viscid secretion becomes lodged over the inter-arytenoid membrane, where it may become dried and form a hard crust. In other cases, again, the hyperæmia may be localised to certain parts of the larynx, and this is particularly the case where the condition is due to continued over-use of the voice. The vocal cords may be pale pink in colour, with small dilated vessels coursing over their surface, or they may appear as reddish bands with rounded edges, while in other cases the free border of one or both may be irregular in outline. The irregularity is due to swelling, never to ulceration, in simple chronic laryngitis.

Diagnosis.—In most cases of simple chronic catarrhal laryngitis the diagnosis is readily made by a careful laryngoscopic examination. Where the tissue changes, which will be described later, have occurred, considerable difficulty may be experienced, especially in excluding tuberculosis. In all cases of doubt the sputum and the chest must be carefully examined. Syphilis and cancer are more easily excluded.

Prognosis.—This will greatly depend on the patient's ability to carry out treatment. If his circumstances compel him to continue to strain his voice, or prevent him from seeking a purer atmosphere, or otherwise to protect himself from the conditions which caused and which keep up the irritation, little permanent improvement can be hoped for from medication. When the conditions are the reverse of these, the majority of cases will be found amenable to treatment.

Treatment.—(a) **General.** In all cases the underlying cause should be ascertained and removed where possible. If it has been caused by the over-use of the voice, or from faulty voice-production, the patient should be impressed with the necessity of carefully regulating its use, or, it may be, of wholly resting it; and when the inflammatory process has subsided, instruction in vocalisation should be recommended. In every case the voice should be used sparingly, and public speaking prohibited. Where it is due to nasal obstruction this should be rectified. Food should be simple and non-irritating, condiments, pickles, highly-spiced foods, alcoholic liquors and tobacco should be withheld. In gouty, rheumatic and dyspeptic patients, special dietary is frequently necessary. In the majority of cases general tonics are required, for all, fresh air is most essential, and where the patient's health is enfeebled, change to a dry bracing climate is often of advantage.

(b) **Local.**—Local medication consists chiefly in the use of hot moist inhalations, sedative or slightly stimulating in character, and the application of metallic astringents.

For purposes of inhalation, oil of eucalyptus, oil of pine and other terebinthinates, rendered miscible with water by the admixture of light carbonate of magnesia (see formulæ), are useful. Where huskiness is a marked feature, or where there is aphonia an inhalation on the following lines will be often helpful:

R Spt. Camphoræ	-	-	-	3j.
Spt. Menth. Pip.	-	-	-	3j.
Acidi Carbolici	-	-	-	3j.
Tinct. Benzoin Co.	ad.	-	-	3j. M.

Sig.—A teaspoonful to be added to a pint of hot water in a Maw's inhaler (or in a quart jug), and the steam to be inhaled for five minutes.

The approximate temperature may be readily obtained by half-filling the *cold* ware inhaler, or the quart-jug, with

boiling water. The temperature of the water is reduced by the cold jug to a point at which it can be used with safety and benefit.

This inhalation should be repeated two or three times a day provided the patient can remain indoors, but when it is necessary for him to go to work, and especially during the prevalence of cold weather, it is advisable to employ the inhalation at bedtime only. In no case should the patient leave his room for at least one hour after the use of a hot inhalation.

By the use of medicated steam, the circulation through the parts is increased, with a consequent increase in the secretions, and the surface, cleaned and moistened, is in a more favourable state to receive benefit from local applications. Where, for any reason, it is thought unwise to recommend hot inhalations, the interior of the larynx may be sprayed at frequent intervals with ipecacuanha wine, which tends to promote secretion from the surface. In cases in which the patient is under the necessity of pursuing his work in an impure atmosphere, a respirator should be worn as a protective measure.

Following the removal of the dry adherent mucus, an astringent solution should be gently painted, or sprayed, over the congested, hypertrophied mucous membrane.

Among the metallic astringents most useful for the purpose are: nitrate of silver, in strength varying from 5 to 40 grains to the ounce of water, according to the degree of thickening of the mucosa: sulphate of copper, 15 to 30 gr.— $\bar{3}j$: sulphate of iron, 30 to 60 gr.— $\bar{3}j$: chloride of zinc, 10 to 20 gr.— $\bar{3}j$: and perchloride of iron in glycerine in the proportion of one part of the iron salt to four of glycerine.

These solutions may be applied by means of a wool-brush, made of absorbent cotton-wool fixed to the end of a laryngeal probe. To make a wool-brush, the cotton-wool is teased out, the roughened point of the probe is placed at

the edge of the piece of cotton, and while the cotton and probe point are held firmly between the thumb and index finger of the left hand, the probe is turned from left to right until the whole of the wool is wound around, and firmly fixed to, the probe. So made the wool will not readily slip off.

In making an application to the interior of the larynx, the patient should be seated as for a laryngoscopic examination, and he should hold his own tongue in the protruded position. The surgeon holds the laryngeal mirror in the left hand, and the probe in the right hand. The patient, with his mouth widely opened, is directed to inspire deeply, the mirror is placed in position, and with the larynx in full view he is then asked to breathe out, and while doing so the surfaces are quickly, but very gently, painted over with the solution. If the patient will then quickly close the mouth and breathe through the nose, spasm of the larynx will be prevented. The first application should be with a 15 per cent. solution of cocaine, and after the lapse of two minutes the astringent solution should then be applied.

Where a simple catarrhal laryngitis persists for a lengthened period, the intrinsic muscles of the larynx become enfeebled, and after the inflammatory process has passed away the voice may be weak and uncertain. In these cases strychnine and iron are usually beneficial, and the complete restoration of the vocal functions may be hastened by the application of the Faradic current.

The treatment of those cases in which serious tissue-changes have occurred, is described as the different forms are dealt with.

(2) **Pachydermia Laryngis.**

The inflammatory process in some cases leads to a localised hyperplasia of the epithelium and the sub-epithelial connective tissue within the larynx. The resulting swelling was described as a pachydermia laryngis

by Virchow, whose observations were based on certain hyperplastic changes seen *post-mortem* on the vocal cords.

Pachydermia laryngis affects two localities particularly, namely the inter-arytenoid membrane and the vocal cords posteriorly. When in the former site it leads either to a general thickening and wrinkling of the inter-arytenoid mucous membrane, or to the formation of an outgrowth, often fleshy in appearance and rounded or pyramidal in shape, and so bulky as to interfere mechanically with the approximation of the cords during phonation. When the vocal cord is affected the site of the tumefaction is usually posteriorly, in the immediate neighbourhood of the *processus vocalis*. The process may affect one or both sides, and when both are affected, it frequently takes the form of a tumour on one cord and a depression with elevated edges on the other, at the point of contact.

Symptoms.—Voice and respiration may both be affected. The voice may be husky or there may be aphonia, depending on the degree of interference with the movements of the cords. When the tumefaction of the cords is extensive, and when the inter-arytenoid pachydermia is large, a sense of swelling in the throat and attacks of dyspnœa may be complained of. Pain is unusual, but in some cases there may be streaks of blood in the expectoration.

Diagnosis.—Pachydermia laryngis is most readily confounded with a tubercular lesion of the larynx.

Pachydermia is a very chronic lesion, the patient is usually in good health and sputum is free from the bacillus of tubercle.

Prognosis.—While pachydermia is in many cases difficult of cure, it does not tend to take on malignant action, or to otherwise become a menace to health.

Treatment.—As the pachydermatous swelling is part of a chronic catarrhal laryngitis, treatment on the lines already described should be followed, with the addition, it may be, of

more active local applications. Abstinence from alcohol and tobacco should be insisted upon, and all sources of local irritation should be avoided.

Locally, and after the surfaces have been anæsthetised with cocaine, nitrate of silver in the stronger solutions may be used, or the daily application of iodine in the form of Lugol's solution, or the application of tri-chloroacetic acid carefully confined to the swollen area. Should these fail to reduce or remove the outgrowth, it may in many cases be very satisfactorily removed by means of the electric cautery. I have removed a large inter-arytenoid pachydermia completely in several instances with the electric cautery, with good results, and without either immediate or remote complications. Those on the cords are readily destroyed with the cautery.

When the inter-arytenoid growth is very large, the use of cutting and punch forceps for its extirpation have been recommended.

(3) Subglottic Hyperplasia.

In this condition, there is a hyperplasia of the subglottic connective tissue, but as a simple catarrhal lesion it is of much more rare occurrence than might be expected. It is more often dependent on syphilis or tuberculosis, sometimes it occurs in association with hypertrophy of the faucial and lingual tonsils, and it has been looked upon by some as due to chronic infective rhino-scleroma.

Symptoms.—The symptoms depend entirely on the degree of swelling present.

The voice may be hoarse, muffled, or aphonic; the respirations are noisy and laboured, and as the swelling increases they slowly become more difficult. Intermittent attacks of acute dyspnoea may occur, but, apart from these attacks, respiration often becomes so seriously impeded as to endanger life.

Diagnosis.—If there is no urgent dyspnœa present, the subglottic swelling can readily be seen on laryngoscopic examination. In the further diagnosis it is necessary to exclude syphilis, tubercle, and cancer.

Prognosis.—The prognosis is serious in all cases of chronic subglottic laryngitis when accompanied by much swelling. Death may be warded off by opening the trachea, and the introduction of the tube ensures rest to the larynx.

Treatment.—If it be the result of a simple catarrhal inflammation, treatment should be on the same lines as that recommended for chronic catarrhal laryngitis, namely, hot inhalations, and the direct application in tolerant cases of metallic astringents carefully applied. Reduction of the swelling may be hastened by the use of iodide of potassium, given at first in small doses to avoid the risk of increasing the œdema. If a good result follows its use, the dose should be slowly added to.

When the swelling persists and steadily increases, the probability is that the condition is other than a catarrhal lesion, and in all likelihood it will prove to be either syphilitic or malignant. Where dyspnœa is severe, tracheotomy should be performed without delay. This operation may be followed by thyrotomy, in order that the nature and extent of the new growth may be ascertained, and the outgrowth removed where that is possible.

(4) Chorditis Tuberosa.

Chronic laryngeal catarrh in voice-users is apt to lead to the formation of small nodules on the vocal cords. This form of pachydermia (chorditis tuberosa) is accordingly usually spoken of as “Singers’ nodules” or “Teachers’ nodes.”

Etiology.—The nodules are most commonly met with in females, usually singers or teachers by profession. They are

caused in part by the forcing, and the faulty use, of the voice, but chiefly by straining the voice, as is so apt to occur in the attempt to control and teach large classes of noisy children, often in overheated rooms.

Auctioneers and preachers, amongst males, occasionally develop the nodules, as do others who strain the voice in trying to make themselves heard in a noisy factory, and the like.

Symptoms.—Impairment of the voice, rather than hoarseness, is complained of, and a teacher after speaking for a time finds that the voice becomes weak and fatigued. As the nodules increase in size, hoarseness may be complained of, and this becomes more evident if the patient tries to raise the voice.

In the early stage the impairment of the voice may seriously affect the professional singer, but at a later stage, singing becomes impracticable.

Diagnosis.—Singers' nodules form on the free margin of each vocal cord at the junction of the anterior and middle thirds. Sometimes one cord is affected before its neighbour, but usually both are affected, and apparently simultaneously. The nodules vary in size from little more than a speck to something larger than a pin's head, and they are white, sometimes glistening, in appearance. They consist of cornified epithelium with hyperplasia of the sub-epithelial tissue, and are the results of irritation, rather than actual inflammation.

As they increase in size they may become pink in colour, while the larynx in every other respect remains unaffected.

Prognosis.—Under appropriate treatment the full use of the voice may be regained in the majority of cases.

Treatment.—The causes which have led to the formation of the nodules should be carefully sought for, and as far as possible they should be removed. The voice should be used sparingly, and everything which might lead to straining of

it should be avoided. The majority of female teachers pay no attention to the art of speaking, and some, when they desire to raise the voice, screech, an action which is productive of many laryngeal troubles. Tuition in the correct methods of voice production should be urged, and the development of the deeper tones encouraged.

In addition to rest for the voice the larynx should be soothed by the use of sedative steam inhalations (see formulæ). Treatment on those lines will result in the disappearance of the nodules, in many cases attended to in the early stages. If this treatment is not fully successful, their disappearance may be further hastened by the very careful application of solid nitrate of silver to the new growth, the larynx being previously well anæsthetised with cocaine.

Where the nodules are of larger size and of long duration, they should be removed by operation. Cutting forceps are usually recommended for this purpose, but I strongly advocate the use of the electric cautery, which I employ to the exclusion of all other instruments for this purpose (see treatment of benign intra-laryngeal growths). For the operation, a very fine platinum point should be chosen; the larynx must be deeply anæsthetised with cocaine, and the patient's head must be firmly held. The cautery point is passed into the larynx cold, the platinum point is placed against the centre, or the most prominent part, of the nodule, electric contact is then made, and the heated wire is kept in position until it has burned into the nodule to a depth nearly in line with the free margin of the cord. The cautery is then withdrawn, and in many cases, what has been described, is sufficient. If the nodule be unusually large, the process may be repeated, the projecting parts, immediately in front and immediately behind the area first destroyed, being cauterised in the same manner. Following this operation the patient should be confined to bed for from three to five days; he should keep silence, and any intra-laryngeal

discomfort there may be, can be soothed with warm sedative inhalations. The part of the cord in the neighbourhood of the cauterised nodule becomes inflamed after the operation; but this condition subsides within a few days, and leads to no complication. I have never seen œdema of the glottis as a complication of this operation.

(5) **Laryngitis Sicca.**

Chronic atrophic laryngitis or laryngitis sicca is a name rather than a disease, and is applied to those cases in which the laryngeal mucosa has become atrophied, and where secretion is deficient in quantity, and altered in character.

Etiology.—Laryngitis sicca is in most cases associated with, and secondary to, an atrophic rhinitis and an atrophic pharyngitis. As met with in women, it is often dependent on general anæmia, and is associated with chronic dyspepsia and excessive tea-drinking; while in men it may appear as a late result of a chronic catarrhal laryngitis, and is largely influenced by his habits and surroundings. Then it occurs in chronic alcoholics, in those who use tobacco to excess, as well as in those who spend their days in badly-ventilated, over-heated and dusty workrooms. In some instances it is syphilitic in origin.

Symptoms.—Where there is an associated atrophic pharyngitis, dryness of the throat may be complained of. The larynx quickly becomes tired by speaking, and there is a varying degree of hoarseness. The retention of dried secretion may cause aphonia, and in those cases where the secretion accumulates and becomes crusted within the larynx, attacks of dyspnœa may occur. The decomposing crusted secretion gives rise to fetor of the breath, which in some cases is simply disagreeable, while in others it is very offensive.

The atrophic process may spread to the subglottic region of the larynx, and in some cases the trachea may become affected.

Diagnosis.—In laryngitis sicca the laryngeal mucous membrane is usually pale and dry, and secretion will be found adhering to its surface in the form of patches or crusts. The patches may be yellow or grey in colour, but the crusts are dark and sometimes almost black.

Prognosis.—The cases due to anæmia improve satisfactorily if appropriate treatment can be carried out. When it occurs as a result of chronic catarrhal laryngitis, improvement may be slow, but in the end is satisfactory; while in those cases associated with advanced atrophic rhinitis, the result will depend largely on the extent of tissue-change which has occurred, and to what extent the patient is able to change his mode of life and his unhealthy environments.

Treatment.—Any condition which might excite or aggravate the atrophic process should be corrected or removed, and the patient's general health should have careful attention. The drinking of boiled or stewed tea, so common amongst girls employed in factories, and which is not infrequently the determining cause of dry pharyngitis, should be prohibited.

In laryngitis sicca associated with anæmia, preparations of iron combined with ammonia, such as the citrate of iron and ammonia given with aromatic spirits of ammonia and glycerine, are of much service. In other cases carbonate of ammonia, chloride of ammonium, iodide of potassium, and tincture of jaborandi, may each, by increasing the flow of secretion, prevent its retention within the larynx. Locally much good may be obtained from the inhalation of volatile antiseptics, and where the breath is fetid the inhalation of steam impregnated with oil of eucalyptus, carbolic acid, or oil of creosote, gives much relief. Crusts of secretion may be

removed by spraying the surfaces with a warm alkaline solution such as—

R	Sodæ Bicarb.	gr. x.
	Sodæ Biborat.	gr. v.
	Aq.	℥j. Solve.

This effects no permanent improvement, but by its use the surfaces are cleansed, and prepared for further treatment.

Further treatment consists in the application, by means of a swab, of weak solutions of nitrate of silver, sulphate of copper, or of iodine; or the spraying of the parts with menthol, camphor, or thymol, dissolved in olive oil or in paroleine.

In very chronic cases, and in cases where the atrophic process has extended to the subglottic region or to the trachea, the intra-laryngeal injection of menthol and guaiacol dissolved in paroleine, as used in the treatment of tubercular laryngitis, gives much relief. From one to two drams of the solution may be injected daily, in the manner described in the section dealing with the treatment of tuberculosis of the larynx.

CHAPTER XII.

TUMOURS OF THE LARYNX.

NEW growths, both **innocent and malignant** in character, are met with in the larynx, and by means of the laryngoscope, they can be diagnosed with precision, and operated upon with accuracy.

(I.) BENIGN NEOPLASMS.

Growths of an **innocent character** are met with in persons of all ages from infancy onwards, though they are most common in early middle life, and least common in old age. They are met with in both sexes, the relative frequency being about three in the male to two in the female.

New growths met with here are as varied in structure as those occurring in other parts of the body. Thus we have papillomata, fibromata, and mucous polypi, which are not uncommon; and occasionally cysts, angiomata, lipomata, and chondromata are seen.

Etiology.—Growths of a kind occur associated with tubercular laryngitis, chiefly in the form of exuberant granulations springing from an ulcerated surface. In syphilitic patients, gummata occur in some cases, while in others, masses of granulation-tissue may be seen surrounding a sinus leading to necrosing cartilage. These will be referred to in their appropriate places. Of the causes of benign

growths proper, persistent hyperæmia is perhaps the chief. Faulty production, and forcing of the voice, by a singer may result in the formation of "nodules" on the cords; and in like manner straining the voice, as in shouting on the street or in a noisy workshop, may lead to the appearance of a neoplasm, simply either as the result of the continuous congestion or from the occurrence of a submucous hæmorrhage. I have seen them, when they were apparently due to this cause alone, in clergymen, in coalmen, in boilermakers, in a river pilot, and others. Papillomata in the larynx may be found in those who have warty growths on other parts of the body.

(1) **Papillomata.**—Of the different **varieties** of innocent growths found within the larynx, **papillomata** are of most frequent occurrence, being met with, according to Mackenzie's statistics, in 67 per cent. of all benign tumours of the larynx. They are most usually met with in children, are almost always sessile, occasionally solitary, though usually multiple, and they may occur on any part of the laryngeal surface from the epiglottis

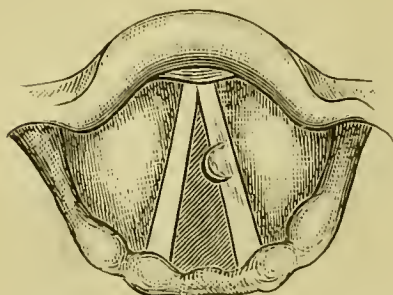


FIG. 47.—Small papilloma growing from left vocal cord. Removed by cautery.

downwards. (See Figs 47 and 51.) In size they vary from that of a pin's head upwards. They are grey or pink in colour, and when large in size the surface is nodular or cauliflower-like. A warty mass may spring from each side of the larynx, and these, meeting in the middle line, may seriously interfere with respiration; while in other cases a single growth may assume such proportions as to threaten suffocation.

While they usually spring from the vocal cords, they may grow from any part of the laryngeal surface; and occasionally they are found in the subglottic region, and on the walls of the trachea. Microscopically they consist of connective tissue covered with epithelium.



(a)



(b)



(c)



(d)

FIG. (a).—Multiple papillomata of the larynx in a man aged 32.

FIG. (b).—Fibroma of the left vocal cord in a woman aged 36.

FIG. (c).—Chronic laryngeal catarrh, with tenacious secretion adherent to, and stretched between, the vocal cords.

FIG. (d).—Large malignant new growth springing from the right ventricle of the larynx in a man aged 61. The tumour proved to be epithelioma on microscopic examination.



(2) **Fibromata** occur more rarely. They are solitary as a rule, and sometimes attain to a great size. When small, a fibroma may be rounded and smooth on the surface, pink in colour, and it generally has a broad base of attachment. As it increases in size it becomes rough and irregular on the surface. In one case of fibroma under my care, the tumour, which was sessile, sprang from the edge, and the under surface, of the right vocal cord, and was fully as large as a common marble.

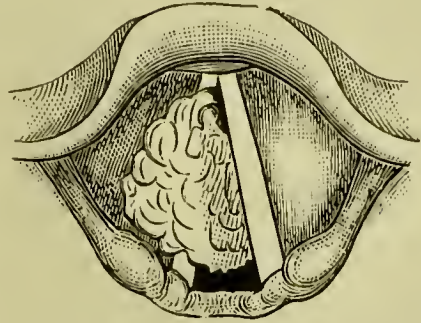


FIG. 48.—Large fibroma attached to right vocal cord and subglottic tissue in man aged 53. Removed by laryngotomy, February, 1890.

It was rough on the surface, greyish in colour, and from its size formed a serious impediment to the patient's respiration. Its removal through the mouth was considered impracticable, and I performed thyrotomy, by which means it was satisfactorily extirpated. The abundance of fibrous tissue seen on microscopic examination, determines its classification.

(3) **Mucous polypi** are occasionally met with in the larynx. In three of the cases which I have seen—one in a man, and two in women—the growths sprang from the same position, namely, the anterior commissure at or below the level of the vocal cords. In each case there was a single tumour only, pale in colour, smooth and glistening on the surface, pedunculated, and resembling a nasal mucous polypus in structure. In one of my cases, a woman 54 years of age, the point of origin of the polypus was immediately below the level of the vocal cords in the middle line anteriorly, and it was attached by a long pedicle. During inspiration it was out

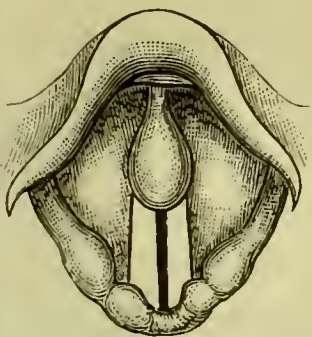


FIG. 49.—Mucous polypus springing from epiglottis below level of vocal cords. Position occupied during phonation. Removed with snare, July, 1886.

of sight, but by a forced expiratory effort, and always during phonation, it was thrown upwards, passing through the glottis with a noise similar to that made by the lips and tongue in pronouncing "fla" sharply. It then lay on the surface of the vocal cords, being made to vibrate by the force of the air emitted. As the cords became separated during inspiration, the polypus slipped downwards and out of sight again.

In one case only have I seen a mucous polypus springing from the ventricle, in which case it rested on, and covered, the vocal cord.

(4) **Cysts.**—These generally occur in connection with the epiglottis, chiefly on its lingual aspect, though I have seen a

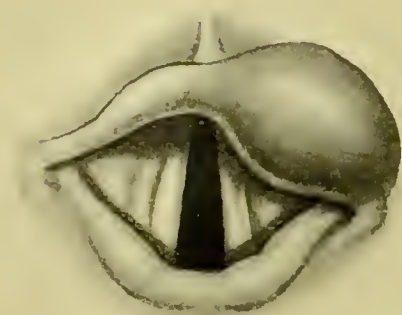


FIG. 50.—A cyst of the epiglottis.

large one on the laryngeal aspect of the epiglottis, extending from the lip of the epiglottis to the upper border of the cushion. They have a smooth surface, are yellowish pink in colour, with small vessels coursing over the surface, and the general appearance gives the observer the impression of semi-translucency.

When punctured, the contents are found to vary; some contain serous fluid, others mucus, while some contain pus.

Angiomata, lipomata, and cartilaginous outgrowths are very rarely met with in the larynx.

Symptoms.—The symptoms which accompany the presence of a benign growth in the larynx vary according to the size of the growth, to its position, and whether it be sessile or pedunculated. Interference with voice (*hoarseness*), with respiration (*dyspnœa*), and in some cases with deglutition (*dysphagia*), are the principal subjective symptoms. A troublesome *cough* may be caused by papillomata in children, but *pain* is exceptional, and when it is present it usually follows on the prolonged use of the voice. *Hæmorrhage* may occur in cases of angiomata.

A growth, no matter how small, placed on the surface of one or other vocal cord, interferes with the vibrations of that cord, and if it springs from the edge of, or is so situated as to project between the cords, persistent hoarseness results. Again, if pedunculated, it may from its movements during respiration produce spasm of the larynx; and dyspnoea may result from the presence of a large growth or from several smaller ones so situated as to materially narrow the air-way. A tumour situated on the epiglottis tends to interfere with deglutition, chiefly on account of its size. But I have had at least one case of a papilloma about the size of a pea, situated on the laryngeal aspect of the epiglottis, immediately below its upper border, with absolutely no symptoms resulting from its presence. A large cyst, on the other hand, may cause unpleasant dysphagia.

In children with multiple papillomata, the health may become enfeebled, general growth checked, and the development of the chest seriously impaired, as a result of the constant obstruction to the free entrance of air into the lungs.

Diagnosis.—The diagnosis is made by means of the laryngoscope, aided, when necessary, by the microscopical examination of a portion of the new-growth.

A long dependent epiglottis and irritability of the fauces may interfere with that careful review of the parts which is essential in cases of laryngeal neoplasms. But both may be overcome by patience and experience. Irritability of the fauces is readily controlled by painting the surfaces lightly with cocaine solution; and the overhanging epiglottis may be raised by means of a hook, or by firm pressure with a curved spatula on the glosso-epiglottic folds.

General congestive swelling of the mucosa, such as may be due to a catarrhal inflammation, may for the time obscure the neoplasm, but on its subsidence the new-growth will be brought into view.

In the case of children the parts can be seen in most cases by the dexterous use of the laryngoscope, and the occasional help of cocaine. If the attempts be unsuccessful, the larynx should be examined while the child is under the influence of a general anæsthetic.

Where the diagnosis is based on the subjective symptoms alone, a case of intra-laryngeal papillomata in a child is apt to be mistaken for one of laryngeal diphtheria, as in both there is hoarseness, dyspnoea, and a frequent short cough. Several cases of laryngeal papillomata are known to me where tracheotomy was performed, and the cases treated for a time, as diphtheria, one of which will be referred to later. A knowledge of the length of time during which the child's voice and breathing had been affected, together with a laryngoscopic examination, will usually suffice to remove all doubt as between the two conditions.

When dealing with a new-growth in an elderly patient, the question of malignancy arises, and it is sometimes difficult, particularly in the early stages, to differentiate between a simple and a malignant new-growth of a vocal cord. The following are the outstanding points on which they differ.

In the case of a benign growth, the small tumour stands out from the surface, there is no infiltration of the surrounding tissue, the cord from which it springs moves freely, and ulceration of the surface of the growth is rarely seen.

In the case of a malignant neoplasm, the part in which it originates is incorporated in the new-growth, and thus it does not appear as a definite outgrowth. On account of this infiltration, the movements of the vocal cord are at first impaired, and at a comparatively early stage the cord becomes fixed.

Prognosis.—Intra-laryngeal new-growths may affect the voice, may cause dyspnoea, which may prove fatal, or they

may recur after removal; so in arriving at a prognosis those three points must be carefully considered.

(1) **The Recovery of Clear Voice.**—This depends largely on the size, position, and nature of the growth. When it is single, pedunculated, and can be removed through the mouth, the normal vocal functions will, in the majority of cases, be restored by its removal. Where the tumour is large and sessile, and in the case of multiple papillomata, whether in a child or adult, clear voice may not be restored by their removal; but if they are removed with skill and care, the voice may be greatly improved, and the improvement in the voice may be progressive.

(2) **Danger to Life.**—Death from suffocation, from the presence of benign growths in the larynx, is, in adults, very rare, and by appropriate treatment is preventible in all cases. In children, on the other hand, the prognosis is more serious, on account of the smaller calibre of the larynx, and from the readiness with which spasm is induced. Frequent attacks of laryngismus in a child, associated with a husky voice, or with aphonia, is of grave significance, and calls for active operative treatment.

(3) **Recurrence.**—In multiple papillomata recurrence after removal is the rule, but after a time this tendency becomes less, and complete recovery ultimately results. In all other forms of benign neoplasms, recurrence is rarely met with.

Treatment.—In considering the treatment to be adopted where there are growths in the larynx, the subject may be conveniently divided into **medicinal** and **surgical** measures, the latter being subdivided into *palliative* and *curative* procedures. Some few isolated instances have been reported of spontaneous cure, the growth being dislodged by coughing; and other cases of spontaneous disappearance have occurred while a tracheotomy tube was being worn. Absorption of warty growths is reported to have occurred, in at least one case, from the pressure exerted by an O'Dwyer's laryngeal

tube, which had been introduced, and continued to be worn, for the relief of dyspnœa. But these cases are so exceptional that they need not here be further considered.

MEDICINAL TREATMENT.

The internal administration of medicines is followed by most satisfactory results in some cases occurring in children. In them we may meet with a roughened condition of the lining membrane of the larynx, the elevations resembling small papillomata though possibly due to inherited syphilis. These children suffer from aphonia, or, if there is voice, it is rough and husky in character. The regular administration of grey powder in small doses— $\frac{1}{2}$ to 1 gr., combined with the same quantity of bicarbonate of soda—is frequently followed in such cases by the disappearance of the prominences, and recovery of voice.

Again, the effects of the administration of arsenic in cases of papillomata in children is sometimes marvellous. As far as my individual experience goes, it cannot be regarded as a specific, as I have found it to fail in several cases, but it is nevertheless well worthy of a trial. I can cite at least five cases of multiple papillomata in children—two males and three females—varying in age from 8 to 11 years, in whom, under arsenic, the growths disappeared. They did so entirely in four of the cases, while in the fifth, the smaller growths disappeared, leaving one, somewhat larger than a split pea, situated at the junction of the cords anteriorly. Arsenic, as is known to dermatologists, exerts its influence chiefly upon the epidermis, and diseases affecting the more superficial strata of the skin are most amenable to its influence. According to Dr. Duhring, it possesses little or no effect upon the diseases which have their seat in the deeper structures. Thus, while the papillomata is small and connected with the epithelium alone, arsenic may be

expected to exert a favourable influence upon its removal. Liquor arsenicalis (Fowler's Solution) is the most suitable preparation to employ, and the dose, beginning with one minim, repeated twice daily, should be gradually increased.

SURGICAL TREATMENT.

Surgical treatment consists of palliative and curative operations.

(1) The chief **palliative** measure is tracheotomy. It is resorted to for the relief of breathing in those cases where, for some reason, a radical operation is impossible. In cases of emergency, tracheotomy may be performed as a matter of urgency in curable cases, to be followed later on by a radical operation.

(2) **Curative proceedings** include the various means for the destruction and the removal of the new-growth, and they are divided into intra- and extra-laryngeal methods, according to whether the operation is performed through the mouth, or by means of an incision through the skin and wall of the larynx or trachea.

Intra-Laryngeal Methods.

Chemical caustics, freely employed in the earlier years of laryngoscopy, are seldom used now for the destruction of laryngeal neoplasms; but the galvano-cautery in its improved forms is of great service. Of other means, forceps and snares are the chief.

Anæsthesia.—In the removal of growths *per via naturalis* a general anæsthetic is never required, except in the case of children. In every case the fauces and pharynx, as well as the laryngeal mucous membrane, should be anæsthetised by means of cocaine, eucaine, stovaine, or other suitable local anæsthetic.

The anæsthetising solution which I use in intra-laryngeal operations consists of two parts of a fifteen per cent. solution of cocaine hydrochlorate and one part of a 1-1000 solution of adrenalin-chloride. The solution should be applied, not by means of a spray, but by a swab made of cotton-wool firmly fixed by twisting to the end of a probe, which latter should be so curved that it can be passed easily and deeply into the larynx. The mucous surfaces are rubbed firmly with the cotton soaked in the solution, and care should be taken to anæsthetise the epiglottis and the intra-laryngeal mucosa very fully before beginning the operation. If this be done, no other preparation prior to operation is necessary.

Position.—The patient should be seated in the same position as for an ordinary laryngoscopic examination, and he should be so placed that the larynx can be easily and fully illuminated. As the surgeon requires to have both hands free, the patient is directed to grasp the tongue between the folds of a fine towel, and to hold it in the protruded position. The surgeon then examines the larynx, holding the laryngeal mirror in the left hand, and, with the growth well in view, he introduces the instrument, chosen for its removal, held in his right hand.

Instruments.—A small or moderately-sized solitary growth may be snipped off with cutting forceps, it may be crushed by more powerful forceps and left to slough off, or it may be destroyed by means of the electric cautery.

Electric Cautery.—Since 1890 I have rarely used any other instrument than this for the removal of those benign intra-laryngeal new-growths which could be removed *per via naturalis*. I gave examples of several cases so treated in the first edition (pub. 1894), and in the interval I have operated upon many more by the same means.

Cases.—Amongst the cases previously recorded was one, typical of many, of a lady, aged 25, who had had huskiness for close on five years, caused by a small fibroma which

sprang from the margin and upper surface of the left vocal cord. It interfered with the complete approximation of the cords, and with the vibrations of the left one during phonation. It was a sessile rounded outgrowth, with a diameter of fully an eighth of an inch at its base. In removing it I slowly burned, with a fine knife-shaped cautery point, into each side of the outgrowth, then so cauterised its base as to destroy its blood supply. At the end of a fortnight the voice was perfectly clear, and only on very careful examination could a slight irregularity be observed on the edge of the cord, marking the site of the growth.

One specially interesting case not previously recorded was that of a lady who had been hoarse for two and a half years, and whom I first saw in October, 1900. In July of the same year Professor Schrötter, of Vienna, had removed a growth from her larynx by means of snare and forceps. That operation had been preceded by an eight days' preparation, consisting, among other things, of the daily passage of bougies into the larynx. At the operation there was very free bleeding, and the operation had to be stopped; but at a subsequent sitting the operation was completed. The lady, however, did not regain her voice, and she returned home feeling sure in her own mind that she had cancer. When I saw her in October she was very hoarse, and there was a fleshy growth, fully the size of a horse-bean, springing from the posterior third of the left ventricular band. The new-growth lay on the vocal cord and filled up a great part of the posterior commissure. I assured her it could be successfully removed without any preparatory treatment, which she so dreaded. She returned with her husband a few days later, when under cocaine I removed the new-growth with the cautery, completely and without shedding a drop of blood, at one short sitting. Her voice was fully restored, and there has been no recurrence since.

The advantages which I claim for the cautery over other instruments used for the removal of innocent intra-laryngeal tumours are, that, with the help of a satisfactory local anæsthetic, the growth can be removed without pain, and without the preliminary training of the patient to bear the application of the instrument. The operation is absolutely bloodless, and so the field of operation is at all times clearly visible; it is performed with great precision; with care no harm is done to neighbouring structures, and, further, I have never seen its use followed by œdema glottidis or other complication of any note.

In using the electric cautery for this purpose the current should be of sufficient strength to heat the platinum point quickly, the amperage depending on the thickness of the wire. The point should be of a dull red, never approaching a white heat, and it may be kept at the dull red stage with a fairly strong current, by rapidly making and breaking it at the contact-point.

Very small growths, like singers' nodules, can be removed by pressing the cold platinum point gently against the centre of the outgrowth, then by completing the circuit for one or two seconds only, the growth will be destroyed.

A pedunculated growth is quickly removed by burning through the pedicle, close to its attachment, with a fine knife-shaped platinum point.

When the growth is fairly large and sessile, incomplete removal at the time of operation is sometimes advantageous. With this object in view, I first burn into the substance of the growth, front and back, in a line with the margin of the cord, in cases where the tumour springs from the cord, and then I make a line with the cautery through its base and leave the growth, its blood-supply being thus cut off, to be coughed away. It is usually discharged on the second or third day after the cauterisation, and the surface from which it has been removed becomes perfectly smooth.

Forceps.—The forceps which may be chosen will vary in size and shape according to the situation of the new-growth, and the object aimed at in the use of the instrument, whether for crushing or cutting the growth, or for its evulsion. When used to crush, and thus destroy the vitality of the growth, the forceps must be strong with flat roughened blades, like Mackenzie's; and for cutting purposes Mackenzie's spoon-shaped and punch forceps, Dundas Grant's guarded forceps, and Watson Williams' universal forceps may be instanced as useful. Williams' form ensures accuracy in the work done. One blade alone moves, and in using it, the stationary blade is held in contact with one side of the growth, while the movable blade is made to close upon it.

Snares.—The snare is chiefly of use in the removal of pedunculated polypi.

Papillomata.—Papillomata in adults may be removed by means of the electric cautery or by forceps. Where the cautery is used the operation is never delayed or stopped on account of bleeding; and there appears to be less risk of recurrence when they are removed by this means. Following the operation, the patient should be confined to bed, put on light diet, and the voice should not be used for one week. If there is pain or discomfort within the larynx, soothing steam inhalations may be prescribed, and the use of alcohol and tobacco should be prohibited.

Papillomata in the larynx of a child should, in the first instance, be treated medicinally, if there be no urgent dyspnœa, and the child kept under careful and constant supervision. It must be borne in mind that papillomata in a child sometimes increase in size rapidly, and in other cases they may disappear spontaneously. Should there be evidence of continued increase in the size or number of the growths, then they should be removed. This may be accomplished either by the use of forceps applied

through Killian's tracheoscope, or by an extra-laryngeal operation.

Removal through Tracheoscope.—For this operation chloroform is administered with the patient lying on his back, and when fully under its influence the pharynx and larynx are swabbed with the cocaine-adrenalin solution. The mouth is held open with a gag, and the tongue is grasped with forceps and pulled forwards. The patient's head is then caused to hang over the end of the table, and the surgeon carefully passes the tube into the larynx. The interior of the larynx must be brightly illuminated through the tube, either by using Casper's handle, which contains an electric lamp and a prism, or by a bright light reflected by means of the forehead mirror. The growths must be clearly seen before their removal is attempted. They may be grasped and removed with forceps, like Patterson's, introduced through the tube. This operation is an improvement on that formerly practised by those who condemn the external operation, in that the growths are caught with greater precision; but recurrence of the growths after this operation frequently occurs, and on this ground I favour the external operation, when dealing with a child suffering from multiple papillomata. (*See Extra-laryngeal methods.*)

Fibromata.—These growths are usually smooth, sessile, and of firm texture, which make them difficult to grasp, or crush with forceps. They can, however, except where the growth is very large, be removed with great precision by means of the electric cautery. Where the growth is large, however, and has a broad base of attachment, an external operation should be resorted to for its extirpation.

Myxomata and Lipomata.—When these are pedunculated, and they are usually so, they may be removed by means of the cold wire snare; or they may be removed, close to the point of attachment, with the galvano-cautery.

Angiomata.—On account of their liability to bleed when injured, these growths, when small, should be slowly destroyed by the electric cautery. When called upon to deal with a large angioma, it should be fully exposed by splitting the larynx, and the growth removed by the cautery or by ligature. Electrolysis has been recommended for the destruction of angiomata, but the process is both slow and unsatisfactory.

Cysts.—These are usually situated in the near neighbourhood of the epiglottis, and are thus within easy reach of the surgeon. To effect a cure it is necessary to remove a large part of the cyst-wall. If the cyst is situated on the lingual aspect of the epiglottis, or in the glosso-epiglottic fossæ, it may be grasped with vulsellum forceps and a large part of its wall clipped away with curved scissors; or a part of the cyst-wall may be excised with punch-forceps. If the cyst be on the laryngeal aspect of the epiglottis, it may be opened, and a large part of its wall destroyed, with the electric cautery. Mere incision and evacuation of the cyst is quickly followed by its re-formation.

Extra-Laryngeal Operations.

(1) **Palliative.**—Where dyspnœa, due to the presence of new-growths in the larynx, is severe, either in the form of frequent spasm or of continuous difficulty, tracheotomy must be performed with the object of preventing death from suffocation. This operation, in cases of papillomata in children, is said to be followed by a diminution in the size of the growths, and in some cases by their ultimate disappearance. Tracheotomy is thus recommended by some as a curative operation, but neither result have I, with a considerable experience, ever seen to occur.

Tracheotomy.—The obstruction to the entrance of air caused by the presence of intra-laryngeal new-growths,

makes the operation of tracheotomy in some cases both difficult and dangerous, and the administration of a general anæsthetic, which arrests the action of the accessory muscles of respiration, may add to the dangers.

In very young children with multiple papillomata, however, a general anæsthetic is usually necessary, and in these cases chloroform, slowly and carefully administered, is perhaps the safest; but in children over twelve, and in adults, local analgesics should be employed. While one of many combinations may be used, the following, suggested by Dr. St. Clair Thomson, can be recommended as being both efficient and safe. Cocaine hydrochloride $\frac{1}{5}$ gr., morphine hydrochloride $\frac{1}{50}$ gr., and chloride of sodium $\frac{1}{5}$ gr., dissolved in 56 m. of sterilised water, to which is then added 4 m. of adrenalin chloride solution (1-1000). Where the toxic effects of cocaine are feared, beta-eucaine may be used. The fluid is injected by means of an ordinary hypodermic syringe. The skin over the trachea is cleansed, and the two extremities of the proposed incision are touched with a probe bearing a drop of pure carbolic acid, the resulting white spots being almost insensitive. With the syringe loaded, the needle is pushed into the skin marked with the carbolic, then a drop of the solution is injected. After a short pause the needle is pushed a little further in and another drop injected, and this process is continued until a line of drops lie in and beneath the skin between the two carbolic acid eschars. At the end of fifteen minutes the operation should be commenced.

When about to perform tracheotomy the patient is placed on his back on a table, the shoulders resting on a firm pillow, and the neck is extended and the larynx and trachea thrown into prominence by placing a sand-bag, or a wine-bottle wrapped in a towel, under the neck. The general anæsthetic is then given, or the local anæsthetic is injected, and when the patient is under its

influence, or the part anæsthetised as the case may be, the head is held with the face directed upwards by an assistant. Care must be taken to make the first incision exactly in the middle line. The incision should extend from the upper border of the cricoid cartilage downwards for a distance of from one to two inches. The further dissection is accomplished partly by careful incisions and partly by gentle tearing of the connective tissue by means of a director, the anterior jugular vein being pushed aside in the process. The opening through the deep fascia should be almost as long as the incision through the skin, for a conical wound always leads to difficulties. When the depressor muscles of the hyoid are exposed the fascia between them is divided, and they are held apart with retractors, and these must be held so that the wound remains in the middle line. The isthmus of the thyroid is then exposed and drawn downwards with a blunt hook. A few more touches with the knife will expose the cartilaginous rings of the trachea. *No attempt should be made to open the trachea until the rings are clearly seen.* The trachea is then caught by a sharp hook passed under the cricoid cartilage, by which the assistant, pulling gently upwards, steadies the trachea while it is being opened. The knife is entered just under the second ring, and cutting from below upwards the second and first rings are quickly divided. The edges of the incision are held apart with dilating forceps, and sponges wrung out of hot water are placed over the wound until the cough, excited by the opening of the trachea, has ceased. A silver tube, preferably Foulis' pattern, which gives the least discomfort and is very easily kept clean, is then inserted, and is held in position by means of a tape passed through the slots and around the neck.

The patient is then put to bed, protected from draught, in a room at a temperature of 65° to 70° F. If there is much coughing, the air he breathes should be moistened

with steam, either from a "croup-kettle" or, and perhaps better, by the application of a sponge wrung out of very hot water, and so placed in front of the neck as to cover the end of the tube, so that the air inspired may be warmed and moistened in its passage through the sponge. The sponge is retained in position by a neck-tie of gauze with the ends crossed in front. The sponge should be frequently changed, and at no time must it be permitted to become cold while on the neck.

Where there is no irritation and no cough, the opening of the tube may be covered by several layers of dry sterilised gauze, through the loose meshes of which the inspired air may pass.

When dyspnœa is severe, the veins are usually deeply engorged, and bleeding during the course of the operation may be free and troublesome. This may be controlled in part by the use of pressure forceps, but it will quickly subside after the trachea has been opened, and the patient enabled to breathe freely.

(2) **Curative or Radical.**—At the International Medical Congress of 1881 it was agreed by those in conclave that "every benign laryngeal tumour ought, if possible, to be removed *per via naturalis*, and only if an experienced laryngologist had established the inexpediency of this method should the extra-laryngeal operation be adopted." Laryngologists agree with this in the main, for the majority of simple neoplasms found within the larynx are removable by the one or other of the extra-laryngeal methods, and they should be so operated upon. But there are three outstanding exceptions:

- (a) A large firm fibroma with an extensive attachment, which an experienced operator has failed to remove through the mouth.
- (b) A large angioma, where there is considerable risk of serious hæmorrhage during its removal.

- (c) Widespread multiple papillomata in children. While these are included in the category of benign growths, the persistence which they occasionally exhibit in recurring after removal might be termed "malignant." The growths are numerous; the area affected is extensive, and recurrence is the rule, so that it is quite impossible in many cases to deal with them satisfactorily or successfully *per via naturalis*, and attempts to do so are not infrequently harmful.

The exposure of the larynx by external incision is fraught with certain dangers, chief amongst which is pneumonia, so that every care must be taken, both during the operation and in the subsequent treatment, to obviate this complication. The operation is conveniently divided into two stages.

(1) Preliminary tracheotomy (not universally adopted), followed by (2) thyrotomy or crico-thyrotomy.

(1) **Tracheotomy.**—I look upon a preliminary tracheotomy as a wise procedure. It permits the patient to become accustomed to the use of the tube some days prior to the performance of the major operation, and it minimises the risks associated with thyrotomy.

(2) **Thyrotomy.**—After an interval varying from two to eight days, according to the condition of the patient, the second stage of the operation may be performed. Chloroform is inhaled by the patient through the tracheal tube. The incision made through the skin while performing tracheotomy is extended upwards in the middle line towards and almost up to the hyoid bone, and the cricoid and thyroid cartilages are carefully exposed. Any cut vessel should be ligatured before the cartilages are divided, and by the frequent application of small sponges or gauze swabs on holders, blood is prevented from trickling downwards towards the trachea. To prevent blood from entering the trachea during the progress of the operation, a tampon cannula may be used. Trendelenburg's apparatus, which is

perhaps the best known, is in the form of a tracheotomy tube with thin rubber tissue surrounding, and fixed to, the lower half, and it is so arranged that when the tube is in position the rubber tissue can be inflated to fill up the space around the cannula. These instruments, however, occupy much valuable space, and in my opinion are not required. In doing the operation I keep the tracheotomy tube in position while the patient is being anaesthetised, and until the thyroid and cricoid cartilages have been exposed, and until the bleeding, consequent on their exposure, has been checked. Then the tube is withdrawn, and the cartilages divided from below upwards in the middle line. Some operators split the thyroid cartilage alone—thyrotomy. But in cases of multiple papillomata I prefer to split both cricoid and thyroid cartilages, thus performing crico-thyrotomy, or laryngotomy in the full sense of the term. The cartilages in children and young adults are readily divided by means of a knife or scissors, but in patients over forty, the cartilages are often found to be calcified and so hard as to necessitate the employment of cutting forceps, of which Waggett's is a useful form.

In the performance of thyrotomy it is recommended that the upper extremity of the projecting angle of the thyroid cartilage (*prominens Adami*) should be left intact to ensure the accurate replacement of the parts, including accurate apposition of the vocal cords, after operation. I, however, practise division of the cartilage throughout its length. By doing so, the interior is more easily explored, and growths from the ventricular bands and in the higher reaches of the larynx generally, are more readily destroyed or removed. At the same time, to ensure accurate replacement, in place of continuing the incision in the middle line throughout its length I cut obliquely into one ala near the upper border, and again return to the middle line, so that the parts readily dovetail when brought together after the operation.

By the complete division of the cartilage, extirpation of the growths is rendered both more certain and less difficult, and the notch in the cartilage ensures accurate apposition of the cords afterwards.

According to Mackenzie's statistics, thyrotomy for removal of benign growths is followed by aphonia in 40 per cent. of those thus operated upon, but the proportion of cases in which the voice is recovered after operation has been considerably increased by the improved methods now employed.

When dealing with a malignant growth, on the other hand, such a precaution is not necessary, as in all probability the excision of the part affected will of itself interfere with the vocal function; and in such cases a large incision is usually required for the complete extirpation of the disease.

After division of the cartilages the two sides of the larynx are at once separated and held apart by retractors, the interior of the larynx is carefully dried and illuminated with, preferably, an electric forehead-lamp. The laryngeal mucous membrane is then painted over with the cocaine-adrenalin solution, and by the rapid and careful use of small sponges or gauze mops during the subsequent stages of the operation blood is prevented from gaining access to the trachea and bronchi. With the interior of the larynx exposed to view, the growths are carefully removed. In the case of *papillomata* each individual growth should be dealt with separately, being removed with scissors curved on the flat, or excised with small sharp punch forceps.

A large *fibroma* may be removed with scissors or with a snare, and an *angioma*, with the electric cautery. After the growths have been removed, the larynx is firmly packed with iodoform or double cyanide gauze, the tracheotomy tube is re-introduced and the edges of the divided structures are brought together and held by strips of plaster. On the following day the packing is withdrawn, and the parts from

which growths had been excised, as well as all suspicious points, are cauterised with the electric cautery, or with chromic or tri-chloroacetic acid.

After making sure that no growths remain, and that there is no bleeding from any of the raw surfaces, the cut edges of the cartilages are brought together, carefully fixed in position by one or two sutures, and the upper two-thirds of the incision in the skin is closed.

The tracheotomy tube should be removed at the earliest possible moment; the time at which this could be done safely in my own cases has varied from the second to the fifth day after operation.

Very careful nursing is necessary during the first few days after operation, and pneumonia is the chief danger to be guarded against.

Laryngotomy in the child is an easy operation compared with the operation in the adult, chiefly on account of the greater elasticity of the cartilages in the former.

I have twice performed the operation in the adult for the removal of a large fibroma. In one tracheotomy had been performed hurriedly for the relief of urgent dyspnoea and in it the major operation was performed a few days later. Amongst the several children on whom I have performed thyrotomy for the removal of multiple papillomata, I would quote two cases which illustrate the tendency of those growths to recover, and the excellent results obtained by thyrotomy even in the worst cases.

(1) A boy aged 10 years whose complaint was huskiness and shortness of breath on exertion, becoming slowly more severe.

History.—He had a rough voice, with frequent attacks of husky, “croupy” cough for seventeen months, due, his mother thought, to reading aloud at school. Latterly he had had increasing dyspnoea, especially on exertion. For example, in walking from the Infirmary gate, to which he

came by car, to the dispensary, a distance of about 120 yards, he had to stop by the way several times, hold on by the iron rail, and wait till he had recovered his breath.

Condition revealed by Laryngoscopic Examination.—The upper surface of the larynx was hid by warty growths. They presented three distinct clumps—one sprang from the epiglottis, and projected backwards between the vocal

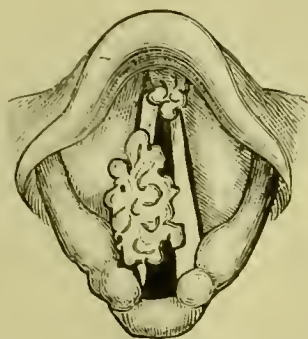


FIG. 51.—Multiple papillomata in boy, as seen during attempted phonation. Removed by laryngotomy.



FIG. 52.—Largest of fourteen growths removed (natural size).

cords; the second and largest mass occupied the greater part of the right vocal cord; and the third sprang from the under surface of the left vocal cord, near to its posterior attachment.

Operative Procedure.—Tracheotomy was performed on the 3rd of October, 1890, and thyrotomy on the 8th October.

The cricoid and thyroid cartilages were divided in the middle line, with the exception of the upper border of the latter, where a small portion was left intact to ensure accurate replacement of the parts.

When opened, the interior of the larynx was seen to be studded with numerous warty growths, some springing from the vocal cords, others from the subglottic region, and many from the wall of the trachea. These were removed with curved scissors, and the parts from which they sprang seared with the galvano-cautery. The cartilages and the

skin were brought together with sutures, and the trachea tube replaced. The tube was removed on the third day, and the patient dismissed on 8th November.

The structure of the new growths was seen under the microscope to be that of typical papilloma.

Result.—The larynx remained perfectly free for twelve months, when a small wart appeared on the laryngeal aspect of the epiglottis, and this was destroyed with the cautery.

On 17th April, 1896, this patient was shown at a meeting of the Glasgow Medico-Chirurgical Society, when he was in perfect health, and with a clear and strong voice.

(2) A male child aged one year and eleven months, with dyspnœa, and with a history of difficulty of breathing since he was six months old. He had suddenly become worse, and his trachea was opened by the house-surgeon on the night of his admission to Royal Hospital for Sick Children.

Four weeks later (20th January, 1895), he was examined for the first time by me, when on examination the larynx was found to be completely blocked with papillomatous growths. One large mass, with a cauliflower-like surface, projected upwards and hid all the structures beneath the level of the arytenoids.

Operative Procedures.—Thyrotomy, 25th January, 1895. Repeated, 8th February; 21st May; 6th September; 27th November; 2nd December; 14th April, 1896.

The interior of the larynx was fully exposed on each occasion by the complete division of the cricoid and thyroid cartilages. At the first operation the numerous unusually large papillomata sprang from the upper surface and free border of both ventricular bands and from the vocal cords; there were also innumerable small elevations, many of them distinctly warty in character, over the lining membrane of larynx and trachea, extending down as far as the level of the third ring. These were carefully clipped away individually with scissors, or, where small and closely

packed, excised with a sharp curette. The surface was seared with a thermo-cautery after the first operation; at subsequent operations, chromic acid and trichloroacetic acid were employed as caustic agents. After the second operation a rubber tube was enclosed within the trachea and larynx, and kept in position for eight days, to exert pressure over the lining membrane, and to permit of the ordinary tracheotomy tube, which had produced ulceration of trachea, being dispensed with.

Result.—After each operation the patient had a season of relief. The sixth operation was on the 2nd December, 1895. The tube was withdrawn on 16th December, and the child did without it till 9th April. During that interval (four months) his breathing was free; he spoke usually in whispers, though on exertion he had voice, which was hoarse and croaky. Towards the end of March he became languid and readily tired, although he looked the picture of health. On the evening of 9th April, while being bathed, he suddenly collapsed, as if from cardiac weakness, lips white, not livid, and not preceded by dyspnoea. A Foulis' tube was inserted, and the child was laid flat on the nurse's knee. Subsequent examination showed recurrence of papillomata. These were removed by thyrotomy on 14th April, 1896, and there has been no further recurrence. The boy is now (1909) 16 years of age, is tall and well developed, and has a good and clear voice, though deeper in tone than is usual at his age.

The growths removed on each occasion were seen on examination to be typical papillomata. The age of the patient at the first operation; the size of many of the growths present; the extent of surface affected; the rapidity and frequency of recurrence of the growths, necessitating the re-opening of the larynx for their removal, and the ultimate good result, make this case a remarkable one.

(II.) MALIGNANT NEW-GROWTHS.

Both **sarcomata** and **carcinomata** occur in the larynx as primary affections, and when the disease in the larynx is secondary to its appearance elsewhere, it is almost always the result of extension from neighbouring structures, and very rarely is it the result of general cancerous infection.

In 1892 I saw one of the exceptional cases. A woman of 49 had an epithelioma of the left vocal cord, the first symptom of which appeared about four months after a scirrhus tumour had been discovered in the left mamma. Sarcoma is of rare occurrence, scirrhus is very seldom met with, while epithelioma is the form with which we almost universally encounter malignant disease in the larynx.

Etiology.—Cancer originating within the larynx is much more common in the male than in the female, the reverse of that which obtains in cancerous disease generally. The average proportion given by Fauvel, Mackenzie, Ziemsen, and others is about 4 to 1. Its occurrence is rare in patients under 35, the majority of cases being met with in patients between the ages of 50 and 65.

The determining cause of cancer of the larynx is as obscure as is the reason for the appearance of malignant disease in other parts of the body; and it is very doubtful how far the excessive use of the voice, of tobacco, and of alcohol can be admitted as predisposing factors.

Position of the Growth.—Cancers of the larynx are divided into two groups, the **extrinsic** and the **intrinsic**, according to the site of the growth, a classification which is of great clinical importance. **Extrinsic** is applied to growths which spring from the epiglottis, the ary-epiglottic folds, the ary-tenoids and the inter-arytenoid membrane, as well as to those which invade the larynx from neighbouring structures. **Intrinsic** comprises those which spring from the ventricles,

the ventricular bands, the vocal cords and the subglottic region of the larynx.

Symptoms and Pathological Changes.—In the early stages of **extrinsic cancers** the symptoms are often obscure and trivial; and a growth springing from the ary-epiglottic folds or from the inter-arytenoid membrane may attain considerable size before much complaint is made by the patient. Even with a large growth in this position there may be but slight interference with the voice and that alone, or respiration may be impaired, especially during exertion, and deglutition may be only somewhat less free than normal. Epithelioma of the epiglottis usually takes the form of an infiltrating growth, with thickened everted edges. It becomes ulcerated in the centre at an early stage and its surface is covered with foul-smelling greyish secretion. As the disease extends, neighbouring structures become involved, and when the cartilage becomes invaded, œdema of the mucosa may obscure the ulcer. While in the early stage, the symptoms may be trivial, but they soon become severe, for the disease extends rapidly. Dysphagia is the chief, and so severe is the pain on swallowing, both in the throat and shooting up to the ear on the side affected, that the patient dreads the act. The pain is probably due to irritation of the sensory fibres of the superior laryngeal nerve distributed to the surface affected, and from which it is conducted to the auricular branch of the vagus. Muco-purulent secretion is copious, and collects over and around the sore, from which it is dislodged by hawking. In the later stages it becomes blood-stained. Loss of flesh and strength may be noted in the early stages, and both become more marked as the disease progresses. Dyspnœa from œdema may occur in the later stages.

A Special Type met with in Young Women.—Occasionally in women about the age of 30 an epithelioma may be found springing from the mouth of the gullet, usually from the

cricoid area. I have seen at least ten cases, all of which ended fatally, in women whose ages ranged from 27 to 36,



FIG. 53.—This shows the upper border of an epitheliomatous ulcer, which sprang from the external aspect of the posterior wall of the larynx and latterly involved the mouth of the gullet in a woman 33 years of age.

and one, aged 40, was seen by me with the late Prof. Sir Wm. Gairdner. The presence of this disease in these cases

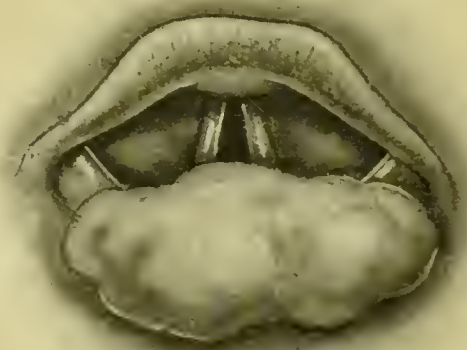


FIG. 54.—Epithelioma, with fungating surface, which apparently had its origin in the cricoid area of the posterior aspect of the external wall of the larynx in a woman 36 years of age.

is in the early stage accompanied by discomfort rather than pain, and slight difficulty in swallowing, the difficulty being usually spoken of as “a tightness.” In the early stage nothing more may be seen on examination than a collection

of frothy mucus between the posterior wall of the larynx and the pharynx, with, it may be, some œdema of the arytenoids. As time goes on, the inter-arytenoid membrane becomes thickened, and the upper indurated border of the epitheliomatous ulcer appears behind the arytenoids, at a somewhat lower level. The new-growth is flattened, it lies between the arytenoids and the pharyngeal wall, and frequently it appears as if it were a reduplication of the mucosa on the posterior aspect of the inter-arytenoid membrane. As it increases in size the voice becomes affected, pain increases in severity, and deglutition, which is accompanied by a crepitant gurgling sound, becomes difficult, or it may be impossible. The surface of the new-growth becomes ulcerated and sloughy in appearance, and the odour of the patient's breath becomes very offensive.

In *all* cases of extrinsic laryngeal cancer the lymphatics, on account of their arrangement and their free anastomoses, are involved at an early stage, and they are sometimes implicated before any special attention has been called to the condition of the throat. When the deep cervical glands are involved they may cause pressure on the recurrent laryngeal nerve and consequent paralysis of the vocal cord on the affected side. Extrinsic cancers are of much more rapid growth than those originating within the larynx proper; their true nature is usually obvious at an early stage, and the early appearance of general cachexia is the rule.

An **intrinsic cancer** usually originates in connection with one of the vocal cords. It is usually of slow growth, and implication of the lymphatics is the exception. The lymphatics of the larynx form a network of their own within the larynx proper, and they do not anastomose with the lymphatics of the pharynx, tongue or neck. The lymphatics in the neck are thus not infected until the intra-laryngeal disease has extended above the level of the ventricular bands, and for the same reason malignant cachexia

is late in appearing in cases of intrinsic cancer. **Hoarseness** is the first symptom to attract attention, and is due either to the changes in the cord itself, or to interference with its movements. Huskiness increases as the disease advances. There may be no **pain** in the early stages, but as the disease progresses pain may become distressing. As the tumour increases in size, **dyspnœa** and **dysphagia** may supervene, according to the position and size of the growth. Those symptoms, however, may be present apart from the occurrence of malignant disease; but in the latter condition there is associated with them a history of gradual **loss of energy**, and it may be **loss of flesh**; the **pulse** becomes small and rapid, and where ulceration has occurred the **breath** is markedly fetid, and expectoration may be streaked with blood.

Diagnosis.—Clinically it is very difficult and sometimes impossible, especially in the earlier stages, to distinguish between the various forms of malignant growths which occur in connection with the larynx.

Sarcoma usually occurs as a sessile tumour, with a smooth or lobulated surface, and is usually pale or yellowish-red in colour.

Epithelioma in its early stage is circumscribed and irregularly circular in form; it tends to spread in all directions and as it advances its surface becomes ulcerated.

The resulting ulcer is irregular in outline, has raised edges, is surrounded by an area of induration, and its surface is covered with foul-smelling secretion, being in every respect similar to an epitheliomatous ulcer as met with in the tonsil, the fauces, or elsewhere.

The diagnosis in **extrinsic** cases usually lies between syphilis and epithelioma. In the latter there is much pain, often out of all proportion to the size of the ulcer, the edges of the ulcer are raised and indurated, and the surface bleeds readily. Where it is possible a portion of the new-growth should be removed for microscopical examination, and in all

cases of doubt the patient should be placed on full doses of iodide of potassium.

Early diagnosis in **intrinsic** laryngeal cancer is of vital importance to the patient.

An intrinsic cancer usually originates in connection with one of the vocal cords, and the appearances presented by the new-growth vary greatly. In the early stage the following varieties may be noted:

- (1) Only a slight localised thickening, with congestion of the affected cord.
- (2) A single outgrowth, with broad base and evidently invading the substance of the cord.
- (3) A general infiltration of the cord, which becomes thick, red, uneven and fixed.
- (4) A small indolent ulcer with raised rounded edges.

The infiltrating tendency of the epithelioma when it affects the vocal cords, and its consequent effect on their movements, was first pointed out by Sir Felix Semon. He stated that if a vocal cord, from which a suspected laryngeal growth springs, shows, at an early period of the disease, a defect of mobility on phonation, other than may be due to mechanical impaction of the growths in the glottis, this sign is almost pathognomonic for the malignant character of the tumour. If, however, this sign should yet be absent when the case comes under observation, such negative evidence does not exclude the possibility of malignancy.

As the disease advances, the surfaces become ulcerated. An epithelioma within the larynx is usually of slow growth, but occasionally it is associated with considerable tumefaction, and the formation of a large fungating mass, the presence of which may cause serious respiratory difficulty. The disease in its further progress may invade the perichondrium and the laryngeal cartilages, or it may spread beyond the confines of the larynx and run the course of an extrinsic cancer.

A simple neoplasm, and chronic laryngitis, may each simulate malignancy, but their true nature may be ascertained by a careful laryngoscopic examination and the consideration of the patient's age, etc. More difficulty is experienced in differentiating between cases of localised intra-laryngeal tubercular and syphilitic lesions, particularly the latter, and cancer. Collateral evidence of disease, the examination of the discharges, and the use of iodide of potassium, will help to clear away doubt in most cases. If doubt still remains after these methods have been adopted, a portion of the growth may be removed with punch forceps, and examined by an experienced pathological microscopist; but this should only be done in those cases which are suitable for, and prepared to undergo, an operation for its extirpation.

It must ever be kept in mind that as a tubercular patient may contract syphilis, so may we have malignant disease, though but rarely, in those suffering from tuberculosis, and we may have, and occasionally do have, cancer developing in connection with a chronic syphilitic ulcer.

Early and accurate diagnosis is thereby rendered difficult, and in some instances an early definite diagnosis may be impossible.

Prognosis.—Cancer of the larynx, when left to follow its own course, ends inevitably in death.

Extrinsic malignant disease usually runs a fairly rapid course towards a fatal issue. Life in some of those cases may be prolonged, and the patient's discomfort mitigated, by the free removal of the parts affected; but as extirpation of the disease placed extrinsically is frequently impossible, such cases are cured in rare instances only.

The prognosis in operable cases of **intrinsic** cases is much more hopeful. The disease progresses more slowly, and as it remains practically a local disease for a considerable time, the lymphatics remain unaffected till a late stage. Excellent

results are obtained from early and complete extirpation of the disease.

Semon's statistics, published 1907, show a cure in 76 per cent. of intrinsic cancers operated upon by thyro-tomy (19 cases out of 25 operated upon), and the condition of the voice of the patient after operation is equally satisfactory.

Treatment.—The subject of treatment may be divided into

- (1) Medicinal treatment for diagnostic purposes.
- (2) Removal by operation, where the new-growth can be thereby extirpated.
- (3) Palliative measures, for inoperable cases.

(1) **Medicinal.**—In all doubtful cases and particularly in extrinsic cases, a course of anti-syphilitic remedies should be prescribed. Iodide of potassium in ten grain doses after each meal, and a mercurial at night, should be used to begin with, and the local condition kept under careful observation. If the local lesion improves, and the improvement is maintained, then the remedies may be continued and the doses increased, under the belief that the lesion is syphilitic in nature. If under the action of the iodide the condition is made worse, the lesion is probably tubercular. Malignant disease, on the other hand, may appear to improve for a time under the iodides, but the improvement soon ceases and the disease again advances.

(2) **Radical Operation.**—In dealing with intrinsic laryngeal cancer, no attempt should ever be made to remove the disease *per via naturalis*. In almost every case the new-growth is larger, and the accompanying infiltration of the tissues is much more extensive, than appearances revealed by the laryngoscope indicate; and the disease can never be wholly removed by this method.

So soon as the diagnosis has been made, no time should be spent on topical applications or the further use of internal medication. Every day's delay lessens the chances of cure

by operation, for the best results are obtained when the disease is in an early stage, and the tumour small and localised.

For its removal one of three operations may be selected: (*a*) thyrotomy with excision of the new-growth, (*b*) partial laryngectomy, and (*c*) total extirpation of the larynx, the choice depending on the extent to which the disease has affected the laryngeal structures.

(*a*) **Thyrotomy** is most suitable for those cases where the disease is confined to the vocal cords. This operation is performed in the same way as for the removal of simple intra-laryngeal neoplasms (p. 209), and a preliminary tracheotomy is advisable. When the interior of the larynx has been exposed to view, bleeding may be controlled, and an uninterrupted view of the parts affected obtained, by the free application of solution of supra-renal extract. The extent of the infiltration having been ascertained, an incision extending down to the cartilage is made around the new-growth in what is felt to be healthy tissue. The new-growth is then grasped with vulsellum forceps, and carefully dissected from the cartilage by the use of scalpel or scissors, curved on the flat, and, where necessary, the periosteal elevator. The resulting raw surfaces may be cauterised to prevent hæmorrhage, which may occur when the effects of the supra-renal extract have passed away; or, and better, the interior of the larynx may be firmly packed with iodoform gauze, the tracheotomy tube re-introduced, and the wound in the neck closed temporarily. The packing should be removed on the following day, the interior of the larynx carefully inspected, and if all is in a satisfactory condition, the cut edges of the thyroid cartilage are placed in accurate apposition, when they are fixed with two or three sutures; the skin incision is closed over the thyroid, but the lower part, namely, that over the trachea, is left open, through which secretions readily escape. If due precautions be taken to prevent blood and secretions

from descending to the air passages, septic pneumonia, which is the chief danger, may be averted.

In illustration of the excellent results which may be obtained from the early and complete removal of a limited intrinsic cancer by this operation, the following case, on which I operated in September 1892, and where the patient is now (1909) alive and well, is of interest.

The man, an engineer, was 56 years of age, tall, erect, and of ruddy complexion. He had complained of huskiness for close on six months, but had given it little attention as he considered it to be the result of a cold, and that it would pass away. Latterly the huskiness had become aggravated, and though unaccompanied by pain, he came for advice to the Throat and Nose Department of the Western Infirmary. I was then from home on holiday, and he was seen by my substitute, who found the whole larynx deeply injected, and the ventricular bands considerably swollen, the swelling being symmetrical, as if the result of a catarrhal inflammation. Hot sedative inhalations were prescribed, and when I saw him ten days later the general swelling had subsided, and a tumour of the left vocal cord was readily brought into view. It occupied the centre of the cord, and its length was equal to half the full length of the cord. It was irregularly circular in outline, bluish-grey in colour, tinged with red, and the substance of the central half of the cord was incorporated with the new growth. The free portion of the left cord, anterior and posterior to the tumour, was, apart from slight injection, normal in appearance. Looking down on the tumour with the laryngeal mirror in the ordinary position, it appeared about the size and shape of a small horse-bean, but on examining it laterally it was seen, as is usual in such cases, to be greater in bulk than the view from above led one to infer. The sketch here given of the tumour in this case would serve for several of the same nature which I have seen, the position, the size, the form, and the colour being almost identical in each. On my strong recommendation he submitted to extirpation of the growth.

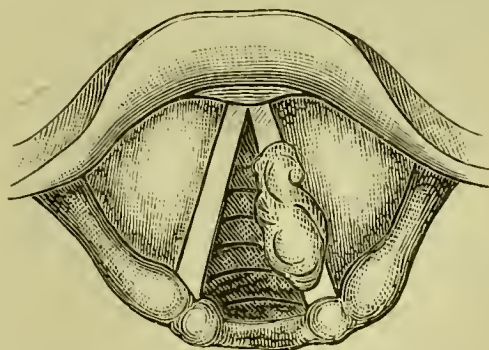


FIG. 55.—Epithelioma of left vocal cord. Removed by laryngotomy, September 1892.

On the 13th of Sept., 1892, I performed tracheotomy, which on account of the short, thick-set form of his neck, and the presence of an unusually large median vein, was somewhat difficult, and it was found impossible to go as low down as is desirable in tracheotomy, preliminary to thyrotomy. On the 20th I opened the larynx in the manner already described. When the cartilages were separated and the tumour fully exposed, the interior of the larynx was illuminated by means of a Trouvé lamp, and the whole of the left vocal cord was carefully dissected off the cartilage, and the surrounding surface cauterised. The tracheal cannula was removed on the fourth day, and the wound in the neck was practically healed at the end of a fortnight. This patient was exhibited at a meeting of the Glasgow Medico-Chirurgical Society seven months after the date of operation, and again in 1906, along with microscopic sections of the growth prepared in the Pathological Department of the Western Infirmary by Dr. L. R. Sutherland, which showed that the tumour had all the characteristics of a typical epithelioma. Now, sixteen years after operation, the man is well, there has been no recurrence of the disease, and his voice is fairly clear. In vocalising, the right cord crosses the middle line and rises to meet the free edge of the left ventricular band, which has thus assumed the rôle of a true vocal cord.

(b) **Partial Laryngectomy.**—This operation is resorted to where the disease, while still unilateral, is so extensive as to call for the removal of the affected half of the larynx. Thyrotomy is the first step in the operation, and the further procedure, and the extent of the operation, will depend on the situation of the disease, and the structures involved. The removal of large portions of the cartilage increases the gravity of the operation. The risks of death from septic infection of the lungs is much greater than in simple thyrotomy, and where the arytenoid region is involved, extirpation of the disease is almost impossible by this method.

(c) **Complete Laryngectomy.**—Total extirpation of the larynx for cancer was first performed successfully by Billroth in 1873, and in this country by Foulis of Glasgow in 1877. Dr. Foulis' case, and the operation he performed, were fully described in the *Lancet* of October 13 of that

year. The operation of complete laryngectomy is selected where there is extensive intrinsic disease, where it is bilateral, or, if unilateral, where it has spread to the arytenoid region.

The method of operating now adopted is that described by Solis Cohen. A vertical incision is made from the hyoid to the sternum, and from its lower extremity a transverse incision is made extending to the sterno-mastoid on each side. The muscles and soft tissues are carefully dissected off the thyroid and cricoid cartilages and the upper part of the trachea, and this is continued well back until the wall of the œsophagus is brought into view. The upper part of the trachea is then carefully separated from the gullet, and when it is free the trachea is cut across, obliquely upwards and backwards. The lower end of the divided trachea is then brought forward, and sutured to the skin. The larynx, grasped at its lower extremity, is pulled gently forwards and is carefully separated from the gullet up to the level of the arytenoids. The pharyngeal attachments of the larynx are then divided. The epiglottis and the arytenoid structures should be left where this is possible and consistent with the free removal of the disease.

The pharynx is then cut off from the wound by a series of deep sutures, which in turn unite the pharyngeal mucous membrane, the pharyngeal aponeurosis, the deep muscles and the sterno-hyoid and sterno-thyroid muscles of one side, to the corresponding muscles of the other side, and finally, the skin is sutured, and appropriate drainage is provided for.

A Foulis tube is then introduced into the trachea, the edges of which are sutured to the skin, and a gauze dressing is applied over the wound and firmly bandaged in order to support the structures which occupy the place of the absent larynx.

Total extirpation of the larynx is a very serious operation, and should not be attempted where the patient is in feeble health or is suffering from any chronic bronchial lesion.

Of nineteen cases collected by Mackenzie, eight died from collapse or pneumonia within two weeks from the date of operation; in three cases, one of carcinoma and two of sarcoma, a cure was effected; and in the remaining cases the disease recurred within from three to ten months after the operation.

Three successful cases out of nineteen operated upon by the older method, form a sufficiently large proportion, when we take into account the nature of the disease, not only to warrant the performance of the operation, but to enable us to strongly recommend its adoption in suitable cases. The improved procedure of Solis Cohen has further diminished the operation mortality, and Gluck has recently recorded a series of twenty-two cases of complete laryngectomy with only one death.

Extrinsic Cancers.—Successful removal by operation in these cases is often impossible, and even in the most favourable cases the results are indifferent. The operation selected must be in accordance with the size and position of the growth; it may be a sub-hyoid or a lateral pharyngotomy, a partial resection of the larynx or its total extirpation. Then as the glands of the neck are always infected in extrinsic cases, their very complete removal is essential in every case. In all cases the serious nature of the operation, the immediate risk, the subsequent discomforts, and it may be the inability to have the disease wholly removed, should be fully explained to the patient and his friends, leaving them to decide for or against operation.

(3) **Palliative Treatment.**—Where operative interference is deemed inadvisable on account of the extensive nature of the disease, the advanced age, or feeble condition of the patient, or for other reason, pain may be modified and discomfort lessened by palliative measures. The mouth and fauces may be cleansed by the use of alkaline antiseptic solutions, or the throat may be sprayed with the same.

When there is much pain sedative steam inhalations may be used or insufflations of orthoform, or morphia with iodoform or iodol, which sometimes give relief for many hours, may be given; and where the pain interferes with deglutition, spraying the surface with a five per cent. solution of cocaine immediately before meals may enable the patient to take food with comparative ease. The choice of food is most important. Semi-solids are more easily swallowed than fluids, so soups should be thickened with arrow-root, peas, or potatoes, and meat jellies, fish and chicken, creams and foods similarly prepared should bulk largely in the dietary. The swallowing of fluids is rendered more easy if the patient will lie prone, face downwards, and suck the fluid through a glass tube or straw.

In the later stages it may be necessary to administer morphia hypodermically for the relief of pain.

As the disease advances there may be dyspnœa, for the relief of which tracheotomy should be performed. The low operation should be selected, and resort to it should not be too long delayed, for the condition of the patient generally is often greatly helped by the operation.

CHAPTER XIII.

FOREIGN BODIES IN THE FAUCES, PHARYNX, NASOPHARYNX, LARYNX, AND ŒSOPHAGUS.

A GREAT variety of foreign bodies may become lodged in the fauces, pharynx, gullet, and larynx. Amongst the most commonly encountered may be mentioned fish-bones, coins, pins, teeth—both natural and artificial—portions of tough or badly masticated meat, beans, splinters of wood, pieces of nut-shell, orange pips, and grape seeds.

Occasionally there may be some anatomical or physiological peculiarity of the parts favouring the lodgment of a foreign body, but in most cases its entrance and its impaction are alike accidental, and unconnected with any special predisposing cause. Occasionally the foreign body is introduced along with food.

(a) IN THE GLOSSO-EPIGLOTTIC FOSSÆ.

Small rounded bodies, such as detached particles of food, grape seeds, apple seeds and their seed capsule, orange pips, etc., may become lodged in the glosso-epiglottic fossæ or in the pyriform sinuses, where they may lie for a considerable time without exciting any special irritation, although as a rule their presence creates considerable local disturbance.

Symptoms.—The complaint made by the patient is that of a sensation of having a crumb lodged somewhere about the upper part of the windpipe. There is the constant desire to clear the throat, and occasionally there are sudden fits of spasmodic coughing.

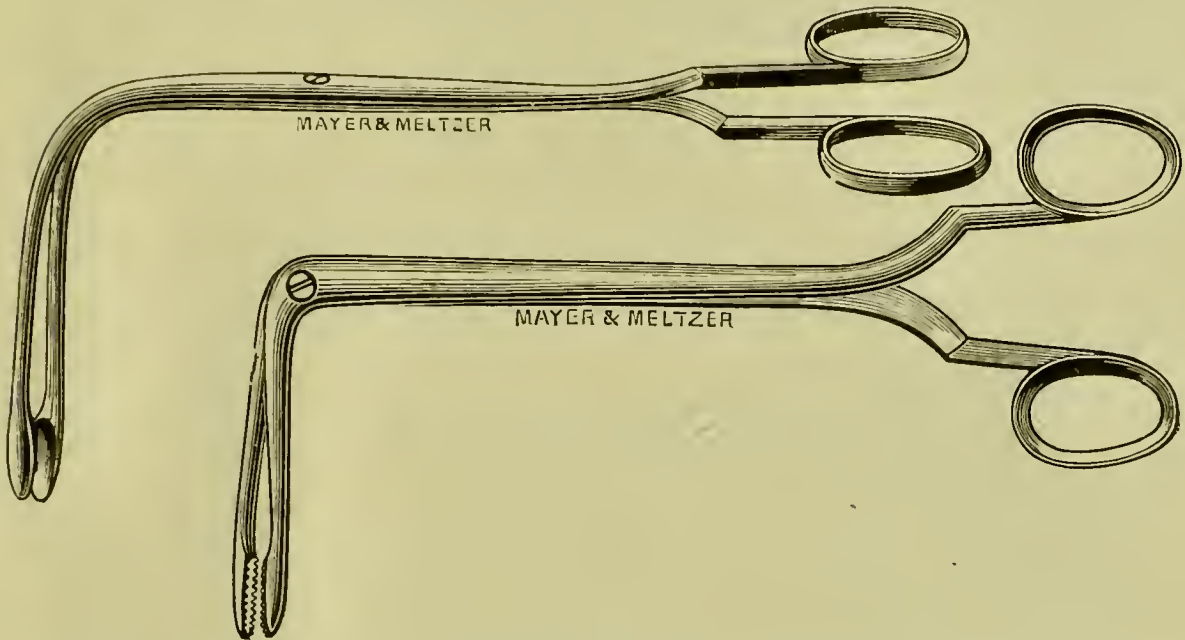


FIG. 56.—Mackenzie's laryngeal forceps, one opening laterally, the other antero-posteriorly.

Diagnosis and Treatment.—Foreign bodies lodged in this neighbourhood are detected by means of the laryngoscope, and their removal is accomplished by the help of Mackenzie's laryngeal forceps, applied under the guidance of the eye.

(b) IN THE FAUCES AND PHARYNX.

Sharp bodies, like fish-bones, pins, needles, splinters of wood contained in bread, and bristles from a tooth-brush, usually become impacted in one of the tonsils, in which case it either penetrates the substance of the tonsil, or it enters one of the follicles. A small sharp bone may enter one of the circumvallate papillæ, or it may penetrate the substance of the lingual tonsil. Usually when a sharp body gets beyond the fauces and tonsils, it passes through the pharynx into the gullet and is swallowed. In its passage backwards

the foreign body may scratch or lacerate the pharyngeal wall, or it may penetrate the wall and become fixed in one of many positions.

Where the **surface has been scratched** by the foreign body in its downward progress, the resulting sensations are similar to those caused by its impaction, and it is often difficult to convince the patient that the part is wounded only, and that no foreign body is present.

Symptoms.—A fish-bone, a needle, or a pin lodged in the fauces, tonsil, base of tongue or pharynx usually occasions sharp pain, sometimes of a stabbing character, which is always increased by the act of swallowing. The pain complained of may not indicate the place of lodgment, for a bone lodged in the tongue may prick the palate, to which the pain is referred.

Diagnosis.—The detection of a fish-bone in the throat is sometimes fraught with considerable difficulty. In searching for a foreign body a clear bright light is most necessary, and it should be used in conjunction with the forehead mirror. It should be remembered that a fish-bone and a bristle when bathed in mucus become translucent, and may come to resemble a “thread” of tenacious mucus, for which either may be mistaken.

The parts should be inspected systematically, the palate, the faucial pillars, the tonsils, and supra-tonsillar fossæ, the base of the tongue with the glosso-epiglottic fossæ, and the lateral as well as the posterior wall of the pharynx, in regular order. And if no foreign body can be seen, the parts enumerated should then be carefully examined with the forefinger, care being taken not to push any sharp body more deeply into the tissues. By means of the finger a fish-bone, deeply imbedded in a tonsil or in the base of the tongue, with no part projecting to catch the eye, may be detected.

Treatment.—When the foreign body has been discovered, its removal is usually readily accomplished. If the bone

or pin projects from the tonsil, pillar, or tongue, it may be grasped with dressing-forceps and extracted. Care should be taken in its removal to pull in the direction in which the body lies, and so avoid tearing the structures or risking its incomplete removal by leaving a broken-off portion in the tissues. If impacted well down in the pharynx, its removal may be accomplished by means of laryngeal forceps, the foreign body being viewed in the laryngoscope during the process of its extraction.

(c) AT THE MOUTH OF THE GULLET.

A large tough body, such as a piece of insufficiently masticated beef or tripe, may become so lodged in the lower part of the pharynx, or at the mouth of the gullet, as to block the entrance to the larynx.

Difficulty of respiration is the immediate result, the patient makes unavailing efforts to get breath, he gasps, and struggles with his neck, and perspires profusely, and, if relief is not quickly obtained, the patient will be suffocated.

Treatment.—As soon as this condition is recognised, the patient's mouth should be opened, and the surgeon's right forefinger passed deeply into the pharynx, with which he should endeavour to dislodge the foreign body by hooking it aside. (If forceps are at hand these should be passed towards the mouth of the gullet, and the tough body grasped and removed, but forceps are seldom at hand when this accident occurs.) If the finger fails to dislodge the obstruction, the patient should then be bent forwards over the back of a chair, and with his head well lowered he should be given three or four smart blows with the open hand over the middle dorsal region, in order to produce a strong expiratory effort, by which the bolus may be dislodged. If this manœuvre is unsuccessful, the trachea should be opened

without further delay, followed, where necessary, by artificial respiration.

(d) IN THE GULLET.

(a) A similar **large tough body**, or a **hard body** like an unmasticated piece of a potato, may pass through the mouth of the gullet only to become impacted at a lower level. The site of impaction varies. It may be barely an inch from the mouth of the gullet, at which level the gullet normally becomes narrowed, or it may be at any part of the gullet beyond.

Symptoms.—Considerable distress follows the impaction of such a body in this region. While the patient can take a full breath, he has a sense of suffocation, and a feeling of swelling or tightness over the chest, and considerable pain both over the sternum and between the scapulæ.

Treatment.—The patient can always explain the reason of his distress, and if it be found on examination that the body has entered the gullet, the most direct way of giving him relief is to gently push the foreign body downwards, and into the stomach, by means of a full-sized gum-elastic œsophageal bougie, or the blunt sponge-covered end of the coin-catcher. As the foreign body enters the stomach, the patient is at once relieved of his distress.

(β) **Coins** and smooth flat bodies may also enter the gullet and there become impacted. In the case of children, copper coins are frequently met with. The accident occurs very simply. The child is playing with a penny or half-penny when, for some reason, it places the coin between the teeth or actually in the mouth. Some sudden movement takes place, the child runs or is about to speak, a sudden involuntary swallowing effort is made, and the coin slips over. While the coin may, and usually does, become impacted towards the upper end of the gullet, it may pass through the gullet and into the stomach. A coin

may remain fixed in the gullet for a lengthened period: one of many which I have treated had been in the gullet for 18 months.

Symptoms.—As the coin enters the gullet the child attempts to cry, gasps for breath, becomes somewhat livid, and appears to be choking. These symptoms soon pass away, and a feeling of discomfort, rarely amounting to pain, along with some difficulty in swallowing, alone remain. In some cases there are no symptoms consequent on its retention.

Diagnosis.—By the use of X-rays and a fluorescent screen, coins and metallic bodies lodged in the gullet can be made visible, and their position ascertained with accuracy. Where this aid to diagnosis cannot be obtained, the presence of the coin may be diagnosed by using a metallic coin-catcher.

Treatment.—Coins and flat bodies having smooth edges are easily removed by means of the coin-catcher.

To obviate struggling during their removal, the patient if a child should have a general anæsthetic. The coin-catcher should have a double “head,” as illustrated, so that the coin may be caught by either side. The instrument is warmed and lubricated, and having the patient’s mouth held open with a gag, the left forefinger is placed in the mouth to control the



FIG. 57.—Coin-catcher.

tongue and to guide the instrument. The coin-catcher is then passed over the finger until it reaches the posterior wall of the pharynx, when its point is tilted in a downward direction, and then it is slowly passed down the gullet, well beyond the impacted body. In withdrawing it, a slight shaking movement should be given to it until it is felt that the coin has been grasped, after which it is slowly and steadily withdrawn. Greater accuracy in the application of the coin-catcher may be ensured by using X-rays during its passage down the gullet.

(γ) **Irregularly shaped bodies**, such as artificial dentures, and flat or long bones from game, chicken, rabbit, and sheep's head, may enter the gullet along with food, and there become impacted.

An artificial tooth-plate may pass from the mouth into the œsophagus along with food, or the accident may occur during sleep. In almost every case the denture will be found to have been imperfect, either broken, much worn, or badly fitted. Where a bone has gained entrance to the gullet, the usual story is that it was contained in broth, and the broth, being very hot, had been hastily swallowed.

Symptoms.—An artificial denture impacted in the gullet may, if small, cause slight discomfort only, but if larger and irregular in shape, or furnished with clasps or hooks, its lodgment may not only give rise to severe pain, sometimes amounting to agony, but it may cause serious, and, it may be, fatal injury. The gullet wall may be torn, and the tearing may be quickly followed by emphysema or septic infection of the tissues of the neck.

Similar symptoms and dangers accompany the impaction of bones.

Diagnosis.—The history is a guide to the nature of the body to be looked for. The parts should first be examined with the laryngoscope, and, if the body is lodged near the mouth of the gullet, a portion of it may be seen, or the

parts around may be œdematous. Where the examination is negative, the X-rays should then be used. If the plate of the denture be metallic, its position will be shown on the fluorescent screen, but if of vulcanite, the teeth alone will be seen somewhat indefinitely. The view obtained of bones by the help of the X-rays will depend on their size and density. Thirdly, search for the foreign body may be made by means of the œsophagoscope.

Treatment.—Where the surgeon is assured that the tooth-plate has no metal hooks, he may attempt to remove it with the coin-catcher; and, if this be done with care, its removal may be accomplished without danger. The traction used in coaxing it out must be of the very gentlest. Flat bones, such as the parietal bone of a rabbit, may be removed by the same means.

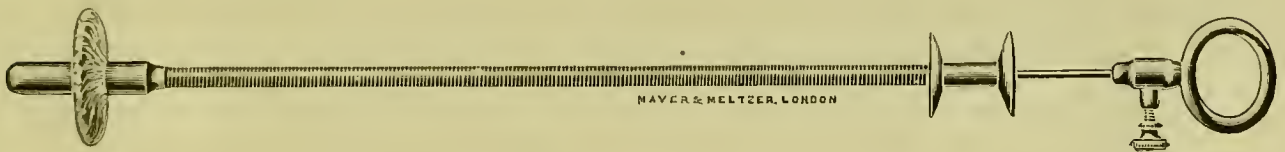


FIG. 58.—Bristle probang in expanded position.

Irregularly shaped bones, long-bones which have trans-fixed the gullet, and dentures with hooks should be removed where possible through the œsophagoscope, Killian's, Brün-ing's, or Chevalier Jackson's instrument being used for this purpose. Where the foreign body cannot be grasped and removed by these means, resort should be had to lateral œsophagotomy.

Small bones and pins in the gullet may either be removed by the older-fashioned bristle probang, if used carefully, or through the œsophagoscope.

(e) IN THE LARYNX.

When a foreign body enters the larynx it is by **inhalation**, never by the act of deglutition. This is equally true

whether the epiglottis be intact, or absent as the result of some ulcerative process.

A crumb of bread or other particle of dry food may pass from the mouth into the larynx, as the result of a sudden in-drawing of the breath, such as precedes a sneeze or a cough; or the accident may occur should one laugh while a small body lies loosely in the mouth.

A **large rounded body**, like a marble, may be sucked into the laryngeal opening, and, getting fixed between the epiglottis and the arytenoids, so completely may it occupy the opening as to cause death by suffocation, unless its immediate removal is accomplished.

A **flat foreign body**, such as a small coin, may be inhaled, and it may become lodged in the larynx between the ventricular bands and the vocal cords, or it may enter one of the ventricles.

A **sharp body**, like a pin, may also be inhaled and become impacted in the larynx. It may enter a ventricle or it may pierce the tissues of the larynx at any part and there remain fixed.

A **small body** like a seed capsule, piece of nut shell, grain of oats, etc., may be inhaled, and on account of its sharp edges may become fixed within the larynx or in the subglottic mucosa. These bodies are chiefly met with in children, in whom their presence gives rise to irritating or spasmodic coughing, with changes in the voice and breath sounds.

Symptoms.—When a small foreign body enters the larynx, violent coughing results, and this may continue until the intruder is expelled. Where the body is retained the irritation persists. In the case of a larger body, there will be, in addition to cough and other symptoms of local irritation, symptoms of suffocation, sometimes alarming in character. The dyspnoea may be the result of actual mechanical obstruction, or it may in large measure be due to spasm of

the glottis induced by the entrance of the foreign body. If the lumen of the larynx be only partially occupied, the spasm will subside, and the patient may again breathe with comfort, but the voice may remain husky. Where the body is a sharp one, much pain may be complained of, and the distress will be aggravated on swallowing.

Diagnosis and Treatment.—Bodies lodged in the larynx are for the most part readily brought into view with the laryngoscope, and their removal may be accomplished by the use of laryngeal forceps introduced under the guidance of the eye.

(f) IN THE TRACHEA AND BRONCHI.

The majority of the foreign bodies which are inhaled pass through the larynx, and lie in the trachea, or enter one of the bronchi. Small bodies, which in the first instance were lodged in the larynx, may be sucked into the trachea during an inspiratory effort, while the patient is coughing.

The bodies are usually small and light, such as particles of food, piece of a nut-shell, a bean, a pea, or cherry stone. Pins also may enter the trachea, and on rare occasions a tooth, immediately after its extraction, has accidentally found its way into the trachea.

Symptoms.—At the moment of the accident, and while the body is in the larynx, there is violent coughing, with, possibly, dyspnœa and lividity of the face. But when the foreign body descends into the trachea these alarming symptoms may pass away, and what follows will depend largely on the size, shape and nature of the body, and the position it finally occupies. If it be small and rounded, there may be no symptoms to indicate its presence, save that it may be felt to move when the fingers are placed over the upper part of the trachea and the patient directed to cough, or breathe out forcibly. But a small body is more apt to

enter and become impacted in one of the bronchi, than to remain free in the trachea. Its entrance into a bronchus is at once followed by a diminution of the quantity of air entering the lung supplied by the obstructed bronchus. This is made evident when the two sides of the chest are observed during deep inspiration; and it will also be found that there is a corresponding unilateral loss of respiratory murmur and vocal fremitus. The patient is restless, his temperature becomes elevated, and if the foreign body is not removed, pneumonia or abscess of the lung will follow. When the body is larger, and more nearly fills the lumen of the trachea, dyspnœa and symptoms of suffocation will be present, which, if not relieved, may terminate fatally. Change of position of a foreign body, such as a coin, may produce alarming dyspnœa in a case where previously there had been no urgent symptoms; and in like manner suffocative symptoms may come on days after the introduction of a body, such as a bean, which may swell by absorption of moisture. Sharp irregularly shaped bodies may set up acute tracheitis, and may lead to ulceration of the walls of the trachea; while the symptoms set up by the entrance of a soluble body, like a sweet, tend to disappear as the body slowly becomes dissolved.

Diagnosis.—In the early stage the condition is usually alarming, and, being without explanation as in many cases, it may be puzzling. Where the symptoms are less urgent, a careful laryngoscopic examination of the parts should be made, to learn whether or not there is a foreign body present, and if there is, to ascertain its nature, size, shape and position. A foreign body in the trachea may be seen with the laryngoscope, or tracheascope, but where it cannot be seen the diagnosis is based on the history and the symptoms.

Treatment.—In cases of urgent dyspnœa caused by a foreign body in the larynx, the patient should be inverted—if a child he may be held up by the feet, while an adult

may be bent forwards over the back of a chair—and when in this position a series of sharp blows with the open hand should be given on the back between the shoulder blades. The forcible expiration so produced may dislodge the foreign body. When this happy result does not follow, tracheotomy should be at once performed. Inversion is not free from danger, as the foreign body when dislodged may become impacted in the glottis, and it should not be employed unless the surgeon is prepared, with everything at hand, to open the trachea at once if required.

One of my colleagues had an interesting experience. While on his round of visits his attention was called to the condition of a child who, while playing at “marbles,” had placed one in its mouth and had suddenly shown symptoms of suffocation. The child was unconscious, its face was livid and covered with perspiration. He at once opened the trachea, the marble was coughed up into the mouth, from which it was quickly removed, and an uninterrupted recovery followed.

In the less urgent cases where the parts can be examined with the laryngoscope, if a foreign body can be seen in the larynx, it can usually be removed through the mouth by means of appropriate forceps. Their application must always be made under the guidance of the eye, and the impacted body grasped while it is clearly seen in the laryngeal mirror.

When the foreign body has penetrated the sub-glottic tissue and cannot be seen, or is lodged in the trachea and has not been dislodged by the “inversion” method, it may either be removed through the tracheoscope, or by opening the trachea. The symptoms may not be urgent if the body is a small one, but its removal should be urged in every case; for its position may become so altered at any moment as to render its retention a source of grave danger. Chloroform must be given for the introduction of the tracheoscope in children, but in adults a local anæsthetic

suffices. Where tracheotomy is employed, as soon as the trachea is opened, the patient, though he be unconscious, takes a deep breath, and this is followed by a sharp cough, which, in many cases, dislodges the foreign body. To assist in its expulsion the edges of the incision should be held apart with retractors. If the body be a large one, it may be removed with forceps, introduced through the tracheotomy wound.

If the body has entered a bronchus, it may be removed through the bronchoscope. Failing this the trachea should be opened, and if it is not expelled by the subsequent cough, a long fine silver probe should be passed through the opening in the trachea down and into the blocked bronchus and beyond the foreign body. This enables air to enter the lung, and its entrance is almost immediately followed by the expulsion of the foreign body.

(g) IN THE LUNG.

By insufflation, a foreign body may reach some of the finer bronchi, from which, by ulceration, it may penetrate into the substance of the lung. A pin, a piece of a tin whistle, a "marble," a tooth, or a cherry stone, may thus enter the substance of the lung, where it may become encysted and remain innocuous, or it may excite a localised suppuration. The resulting abscess usually discharges through the bronchi, and may heal satisfactorily if the body be expelled. On the other hand, an empyema or a fatal septic pneumonia may result.

Diagnosis.—The position of a metallic body should be ascertained by examination with X-rays. The temperature, the results of examination by percussion and auscultation, fetor of the breath, and the examination of the expectoration, will together help to indicate the nature of the changes which have resulted.

Treatment.—By inversion, and a forced expiratory effort, the foreign body may be expelled, even from one of the smaller bronchi; and later, when an abscess has formed, the body may be discharged along with the pus by this method. Sometimes it may be reached through the bronchoscope, but if not, it is often better to leave the foreign body alone and await developments, rather than resort to external operation for its removal.

CASES ILLUSTRATIVE OF FOREIGN BODIES LODGED IN THE AIR AND FOOD PASSAGES.

The following short notes of cases in which foreign bodies had become lodged in the air and food passages, some of them of common occurrence, others unusual and of much interest, are given with the feeling that their recital will help to guide the practitioner when he is called upon to deal with similar cases.

A Fish-bone in the Base of the Tongue.

Some time ago a medical student called on me complaining of a sharp pain in the region of the soft palate. No foreign body could be seen on inspection, but by palpation a very tiny portion of a fish-bone was found projecting from the surface of one of the circumvallate papillae, in the substance of which the rest of the bone was embedded.

Large Fish-bone fixed between Tongue and Pharynx.

A man aged 25, while masticating fish, became sensible that he had a bone in his mouth, and somehow, while trying to separate the bone from the food by means of his tongue, it slipped over. One end had become embedded in the base of the tongue, while the point had penetrated the posterior wall of the pharynx, so that it crossed the larynx antero-posteriorly, and lay in contact with, and pressed upon, the upper border of the epiglottis. It was removed with M'Kenzie's laryngeal forceps, and proved to be an unusually stout bone, measuring one and a half inches in length.

Bone embedded in Hyoid Fossa.

James S., aged 31, was having sheep-head broth for dinner in an eating-house. The bone was contained, though unobserved, in the first spoonful. The broth was so very hot that he gulped it down as soon as it entered his mouth. He at once felt severe pain in the throat, and three hours later he came to the Western Infirmary. There was then œdema of the right ary-epiglottic fold, and of the structures bounding the right hyoid fossa. No foreign body could be seen or felt. Frequent steam inhalations were prescribed, and on the third day the sharp point was seen in the centre of the œdematous area. This was caught with forceps and the bone removed. (Plate VIII., Fig. 1.)

A Threepenny-piece lodged in the Larynx for Four Weeks.

A man, aged 46, was seen by me at the Western Infirmary on September 8th, 1899. He complained of loss of voice and difficulty in breathing, particularly on exertion, of four weeks' duration. The story which he gave was, that on August 12th he was intoxicated. In the early part of that day, while sober, his voice was clear, and he had no difficulty in breathing; but on waking up on Sunday morning, he could only speak in hoarse whispers. He also had considerable pain over the larynx, his respirations were noisy, and he felt as if his windpipe was closing. These symptoms were sup-

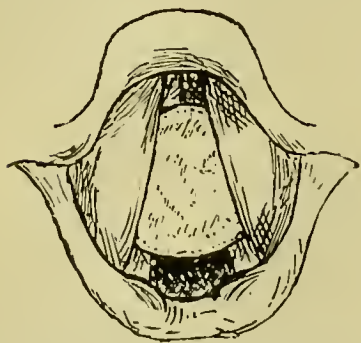


FIG. 59.—Position occupied by a threepenny-piece lodged in the larynx for four weeks.

posed to be due to a "bad cold," and the use of many homely remedies had been resorted to, without, however, giving him any relief. His nephew, who had been with him on the previous night, told him that he had swallowed a "threepenny-bit"; but the patient had no recollection of the alleged occurrence, and maintained that he had done nothing of the sort. (This latter statement was not made until the coin had been removed.)

On laryngoscopic examination the parts were found to be deeply injected. Both ventricular bands were swollen and inflamed. The greater part of the glottis was seen to be occupied by a flat body thickly covered with muco-pus. The body lay on the vocal cords, so that their extremities, anteriorly and posteriorly, alone could be seen.

This foreign body was then gently mopped over with a swab of cotton wool on a laryngeal probe, after which its nature was recognised without difficulty. Although it had lain in the larynx for four weeks, the metal for the most part was bright, and the raised edge and the figure in the centre of the threepenny-piece were readily seen in the laryngeal mirror. The position occupied by the coin is well shown in the accompanying illustration.

The interior of the larynx was anæsthetised with cocaine, and the coin was at once removed by means of Mackenzie's rectangular laryngeal forceps, opening antero-posteriorly.

(Flat foreign bodies retained in the position which this one occupied are most readily extracted by forceps of Wolfenden's pattern ; but on this occasion none were at hand.)

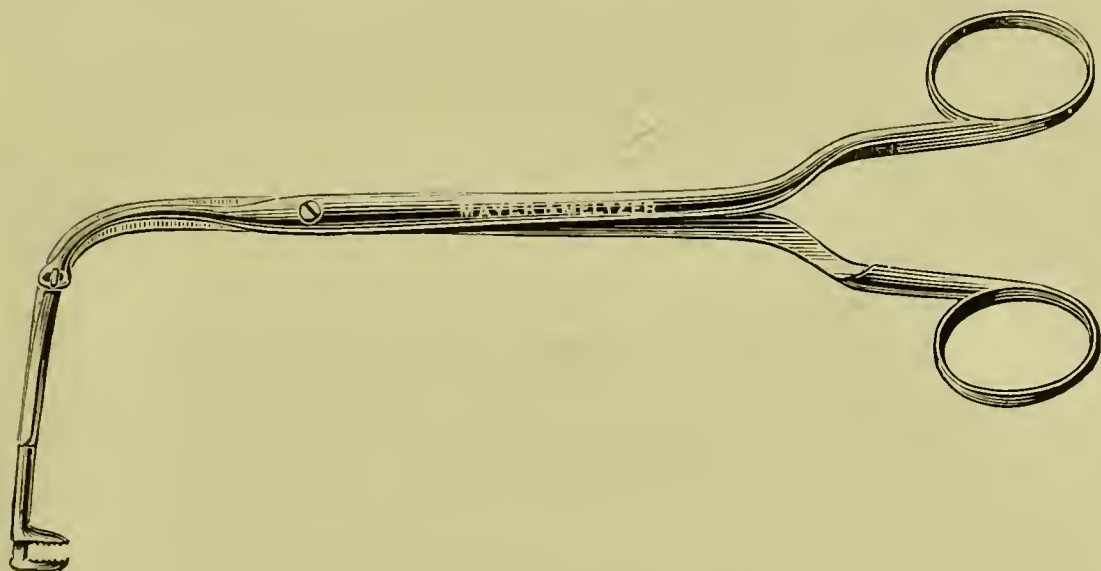


FIG. 60.—Wolfenden's laryngeal forceps.

After the removal of the coin the upper surface of both vocal cords was seen to be eroded. This erosion quickly healed under the influence of soothing inhalations, and within one week from the date of the removal of the threepenny-piece, the patient had fully recovered his voice, and all symptoms of the laryngeal distress complained of while the coin was lodged within the larynx had disappeared. (Fig. 59.)

Pin lodged in the Larynx for Five Months.

D. G., aged 19 years, placed a pin in his mouth before going to sleep on the night of 20th March, 1896. On the following morning the first mouthful of breakfast on being swallowed caused a sharp tearing sensation in the throat, followed by a sharp pain on the right side of the neck, close to the thyroid cartilage. On examination three

days later, his pharynx was found to be inflamed, the right ventricular band was injected and œdematous, and it obscured the greater part of the right vocal cord, which latter was swollen and injected. The structures on the left side of the larynx were unaffected. No foreign body could be seen or felt; but the localised inflammatory œdema, coupled with the history and the symptoms, pointed to the presence of some form of sharp body, but which could not then be located.

The application of the X-rays was then in the experimental stage, and it was not until the 21st August, 1906, that a skiagraph of the neck could be taken. This showed the foreign body to be a bent pin and that it was lodged within the larynx. Four days later the pin was removed through an incision made over the thyroid cartilage. The pin lay antero-posteriorly under cover of the right ventricular band, with the point directed backwards and embedded in an intervertebral disc, and the head had ulcerated its way through the thyroid cartilage close to the middle line in front. (Plate VIII., Fig. 3.)

(This was the first case recorded in which a foreign body, lodged in the interior of the larynx, was discovered by means of the Röntgen rays.)

Portion of the Seed-Capsule of an Apple impacted in the Sub-glottic Region of the Larynx of a Child, two years old.

The patient was a girl, 2 years of age. Early in the forenoon of 10th February the nurse observed the child to be breathing noisily, but with no evidence of distress. The symptoms pointed to catarrhal laryngitis, and the doctor treated the case accordingly. Further enquiries showed that the sudden occurrence of noise in the breathing followed the eating of an apple in the morning in question.

On the 13th I saw the child in consultation. She was contentedly playing with her toys; her voice was clear but her respirations so noisy that they could be heard outside her room. The larynx was normal. On auscultation, air was heard to enter both lungs equally, but with perhaps rather more than the usual diaphragmatic effort. The noisy character of the respirations were apparently due to some obstruction in the infraglottic region of the larynx or upper part of trachea. I advised that the trachea should be opened if the cause of the obstruction could not be dislodged by the induction of a strong expiratory effort.

The parents at this time were averse to operation. On 21st February the doctor wrote that there was no change in the symptoms. Two

days later, operation was decided upon, and on the 25th the trachea was opened. As soon as the rings were divided the lungs became fully filled with air, and all obstructive noise ceased. No foreign body could be seen through the opening in the trachea; it was evidently higher up. A narrow strip of gauze was then passed through the opening in the trachea, gently pushed into the pharynx, and from thence drawn upwards by forceps introduced through the mouth. Two or three inches only had been drawn through when two portions of the seed envelope of an apple were caught in the meshes of the gauze and withdrawn. A tracheal tube was introduced and retained for 24 hours, after which the child made a good recovery. The foreign body had lain in the larynx for 15 days.

**Tooth-plate lodged in Trachea for Three Months.
Removed by Tracheotomy.**

This is the case of a man, Edward C., aged 33 years, who called on me on 27th June, 1902, complaining of difficulty of breathing. His respirations were 40 per minute; he had all the appearances of a man suffering from prolonged dyspnoea, and his voice was husky. He coughed frequently, had pain in the upper sternal area, but no pain in swallowing.

He said that on 5th of the previous April he was watching a football match from the second topmost tier of the grand stand at Ibrox, which collapsed on that day. He fell with 500 others, 25 of whom subsequently died, and he was conveyed in a state of unconsciousness to the Infirmary. In this state he was examined, and it was found that in addition to concussion he was suffering from several wounds in the head, which healed in due course. He was unconscious for 14 days. When he regained consciousness he was husky and had a cough. The house-surgeon prescribed an inhalation, as for a cold, which gave considerable relief. He left hospital on 7th May, but the same symptoms persisted and would not yield to treatment such as blisters and inhalations.

When he visited me (27th June) the fauces and pharynx were found on examination to be normal and the laryngeal mucous membrane but slightly injected. About the level of the third ring in the trachea, however, a white object was seen resembling a bone, and on telling him that there was a foreign body in his windpipe, which might be dead tissue or perhaps a tooth, he exclaimed that he had missed his "false teeth" since the day of the accident.

Further examination convinced me that the object was an incisor tooth. In the evening Dr. Mackintosh made an examination with the X-rays at the Western Infirmary, which revealed the presence and size of the denture, which I removed the following morning (28th June) under chloroform, by opening the trachea. The denture was lying lengthwise, with the tooth uppermost, and it was grasped and removed with forceps. The surface of the trachea against which the denture

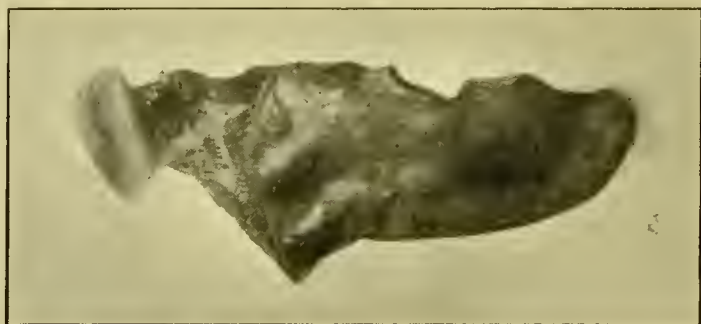


FIG. 61.—Portion of tooth-plate which was lodged in the trachea for three months.

pressed was ulcerated, and there were granulations here and there. The denture was $1\frac{3}{4} \times \frac{3}{4}$ inch with one incisor tooth and two pins, and it had lain in the trachea for 3 months exactly. A tracheal cannula was introduced, and removed two days later, when the wound was closed. The patient could then breathe deeply and noiselessly and speak clearly. His subsequent recovery was all that could be desired.

Shawl-pin lodged in Trachea and Bronchus of an Infant for Three Days.

William B., aged 17 months, while playing about the doorway picked up a shawl-pin. This was taken from the child by his mother, who placed it in the breast of her dress. She then sat down to bathe a younger child, when the little boy came forward to kiss the baby, and while doing so picked the shawl-pin from his mother's dress and went into an adjoining room. Shortly afterwards he returned crying, and bleeding at the mouth. This was at 10 a.m. on Tuesday, 31st December, 1901. The mother saw a black pin in the child's mouth, and in trying to remove it the child so bit her finger that she desisted. The child was taken to a doctor, who, finding nothing in the mouth, sent him to the Western Infirmary. When examined by the receiving surgeon he appeared to be suffering no discomfort. I saw the child on the morning of Friday, 3rd January, and, when examined by X-rays, the pin was seen to have passed down the trachea, and to lie obliquely

with the head well into the left main bronchus, and the point resting against the right wall of the trachea. The child was at once put under chloroform, and the trachea opened. Through this opening long forceps were passed downwards, and at a distance of $2\frac{1}{2}$ inches the pin was grasped and withdrawn. No tracheotomy tube was introduced; the skin wound was stitched throughout two-thirds of its length, and the child made an uninterrupted recovery. (Plate VIII., Fig. 5.)



PLATE VIII.

Foreign bodies which were lodged in the larynx, in the trachea, and in the bronchi.

Pin in Lung for nearly Two Days.

Andrew A., aged 12 years, was holding a pin between his teeth while at play on Friday, 16th February, 1900, about 1 p.m., when suddenly the pin "went over." He complained of pain in his throat, but when brought to the hospital nothing could be seen on laryngoscopic examination. But on examining the chest with X-rays, the pin, an unusually large one, was seen in the lower portion of the left lung with the head downwards and the point directed upwards, and somewhat towards the middle line. There was no pain complained of, nor was there any

disturbance or irritation of the lung caused by its presence. On Sunday, 18th February, about noon, he was caused to lean over the edge of the bed with his head close to the floor, when, after a deep inspiration, he was given a heavy pat on the back with the open hand and the pin was expelled. (Plate VIII., Fig. 6.)

Halfpenny lodged in Gullet for 18 Months.

William G., aged 5 years, was admitted to the Western Infirmary on 27th April, 1900, on account of pain and difficulty in swallowing. Early in December, 1898, while playing with some other



FIG. 62.—X-ray photograph showing the position of halfpenny in the gullet, where it was lodged for eighteen months, and from which it was removed by means of the coin-catcher.

children and pretending to swallow a halfpenny, it slipped over. He was taken to a hospital in the town in which he resided in Ireland, from which he was dismissed, as the story was not credited. I had a skiagram taken on his admission to hospital, and it showed a coin situated in the middle line about mid-sternum. It was removed with the coin-catcher under chloroform. (Fig. 62.)

Halfpenny lodged in Gullet for 28 Hours.

David N., aged 4 years, while playing with a halfpenny on Thursday, 24th January, about 1.30 p.m., tried to conceal it by placing it in his mouth, but it suddenly "went over." He choked, and

coughed, and retched, and afterwards complained of pain when attempting to swallow food. He was brought to the Western Infirmary on the following afternoon, where examination with X-rays showed the halfpenny to be lodged in the gullet at the level of the upper border of the sternum, and under chloroform it was removed with the coin-catcher at 5.30 p.m.



PLATE IX.

- 1 and 2. Two dentures lodged in gullet: removed with the coin-catcher.
3. Rib of rabbit; 4. Parietal bone of rabbit. Both removed with bristle-probang.
5. Portion of mutton-chop bone, which became impacted in the mouth of the gullet and was removed with forceps.

Portion of the Skull of Rabbit impacted in Gullet.

A portion of the skull of a rabbit, swallowed by a lady while at dinner, became impacted in the gullet, giving rise to considerable pain about mid-sternum. It was removed with the bristle probang half an hour after it had been swallowed. (Plate IX., Fig. 4.)

Denture impacted in the Gullet for 18 Hours.

John K., aged 22 years, while asleep about 1 a.m., suddenly woke up with a sense of choking, and found that he had swallowed his artificial teeth. He soon recovered his breath, and was then conscious of a severe pain near the mid-sternum; he also had pain and difficulty on swallowing. The denture was seen by help of the X-rays applied in the Western Infirmary; and the denture, being a smooth and much-worn plate without metallic catches, was removed immediately thereafter by means of the coin-catcher (6 p.m. on the same day). (Plate IX., Fig. 1.)

Two cases of a Denture impacted in the Gullet where each was removed by Œsophagotomy.

The first case was that of a man, Joseph B., 34 years of age, who, when brought to the hospital in the afternoon, stated that, shortly

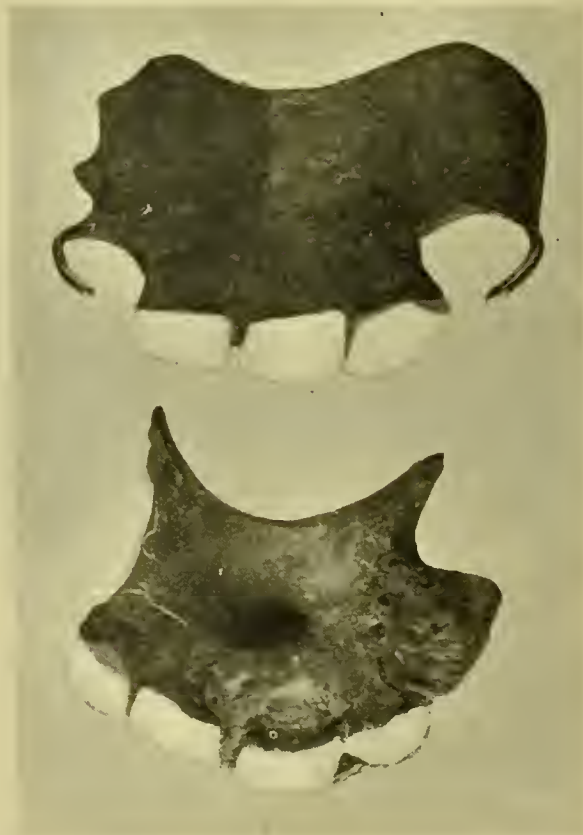


PLATE X.

Artificial dentures which were impacted in the gullet and subsequently removed by oesophagotomy.

after going to bed on the previous night, he woke suddenly with a sense of suffocation and a sharp pain in his throat. He realised that

he had swallowed his false teeth. He could neither eat nor sleep, and was suffering great pain.

An œsophageal probe revealed the presence of the denture in the gullet about one inch below the upper border of the cricoid cartilage. An X-ray examination gave no information, possibly because the denture was a vulcanite one, and contained no metallic parts. An attempt to remove the body with a coin-catcher was unsuccessful, both with and without chloroform. Killian's œsophagoscope failed to reveal the tooth-plate on account of the œdematous state of the mucosa of the gullet. After these attempts to remove the plate had been made, I learned that immediately after the accident he had been at the Royal Infirmary, where several unsuccessful attempts had been made to remove the obstruction. I therefore decided to perform œsophagotomy without further delay. With the patient under chloroform, an incision was made from the sterno-clavicular articulation upwards along the anterior border of the sternomastoid muscle for a distance of $3\frac{1}{2}$ inches. When the œsophagus was exposed it was found that a sharp projecting corner of the plate was pushing out the œsophageal wall, and at this point the wall had sloughed under the pressure.

The gullet was opened at this point, and the foreign body grasped with forceps and carefully removed. It consisted of a well-worn vulcanite palate plate measuring $1\frac{1}{2}$ inches laterally and 1 inch antero-posteriorly. There were four incisor teeth in position and two sharp metal pins, around which a coil of foul-smelling thread was wound, to enable the pins to fit tightly into two tooth-sockets. (Plate X., Fig. 2.)

The gullet was not stitched. Fluid nourishment was given through a tube passed through the nose, along the gullet and into the stomach, the tube being held in place by stitches attached to the bandages. The wound was packed with iodoform gauze.



FIG. 63. — This photograph, taken three weeks after operation, shows the line of incision for œsophagotomy.

Three days after operation the tube was removed. The patient was then fed with milk and chicken tea. At first a goodly part of these fluids escaped through the wound, but the amount so lost soon became less. The wound was kept clean by sipping hot boracic solution after each meal. A week later the patient began to gain weight, and shortly afterwards solid food was administered, and rapid and complete recovery followed.

In the second case there was emphysema of the left side of the neck when the patient came to the Infirmary. The coin-catcher readily grasped the foreign body, which was very firmly fixed and could not be dislodged. The patient was too ill for any prolonged examination, so that Killian's œsophagoscope was not employed.

Œsophagotomy was performed without loss of time, the incision being made in the left side of the neck. No injury of the external wall of the gullet was observed. This plate had a sharp-pointed metallic clasp on each side, by which it had grasped the mucous membrane of the gullet. (Plate X., Fig. 1.)

The same method of administering nourishment was adopted as in the first case, and the wound was likewise left open. Unlike the first case, no part of the fluid nourishment escaped from the wound, and healing proceeded satisfactorily, the patient returning to his work on the twentieth day after operation. No discomfort was experienced as a result of the injury, or of the operation. (Fig. 63.)

Screw-nail swallowed by an Infant and passed per Rectum.

Christina R., aged 13 months, was admitted into Western Infirmary on 31st August, 1899, said to have swallowed a screw-nail. About two and a half hours before admission, the child was lying on the floor playing with some screw-nails. Her father saw her put one into her mouth, and immediately noticed that she seemed to be choking. He put his finger into her mouth, and touched the nail, but failed to remove it. The child was then taken to a doctor, who attempted to remove it with forceps; but the nail quickly slipped beyond his reach. The child on admission to hospital showed no evidence of being inconvenienced by the occurrence. An examination by the X-rays showed the nail to be lying obliquely in the middle line in the cavity of the stomach. The child was confined to bed, and was fed chiefly on bread and milk. She remained well and happy, with no rise in temperature, and without apparently suffering any discomfort; and the nail was passed per rectum on 3rd September at 3 a.m., having been retained

within the body for 60 hours. The nail was a new one, an inch and a half in length, with sharp point, and the head, which had a very sharp edge, was half an inch in diameter. (Plate XI., Fig. 1.)

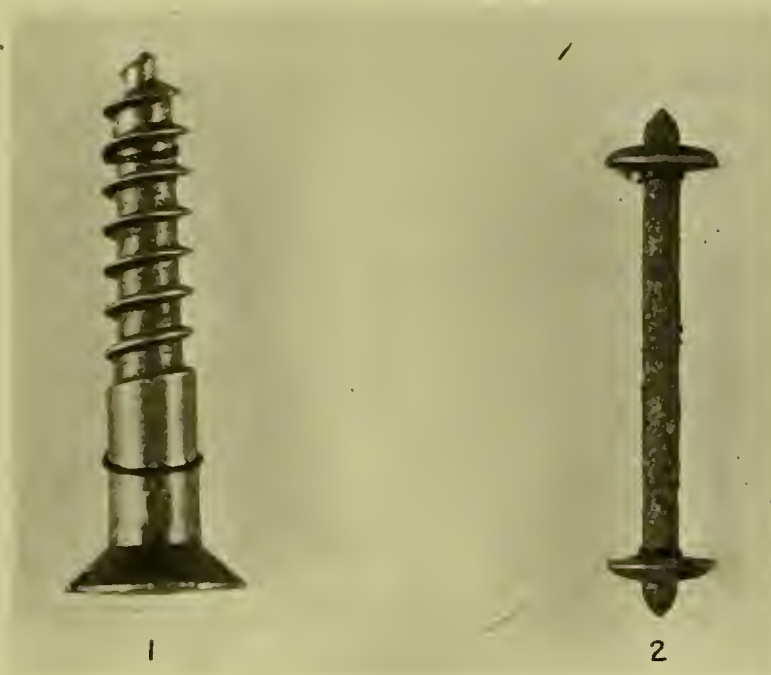


PLATE XI.

Foreign bodies which were swallowed and were passed per rectum.

Metal Spool swallowed by a Child and passed per Rectum.

Elizabeth H., aged two years, while playing with the contents of the drawer of a sewing machine cabinet, swallowed a spool. The child coughed, and seemed to choke, but soon became well again, and did not cry as if in pain. Although one spool was missing, it was doubtful whether it had been swallowed or not. The child was fed on porridge, bread and milk, etc., and its motions were carefully examined. On the third day the spool was passed per rectum. During its retention there was neither pain, discomfort, nor any rise in temperature. (Plate XI., Fig. 2.)

CHAPTER XIV.

SYPHILIS.

I. SYPHILITIC AFFECTIONS OF THE MOUTH, FAUCES, AND PHARYNX.

IN the routine examination of patients suffering from affections of the throat, we are constantly reminded of the wide distribution and the far-reaching character of syphilis, by the frequency with which it is encountered. In this region evidences will be found of syphilis in all its forms and stages. A primary sore, though rarely met with here, is occasionally seen, and the possibility of its occurrence must always be borne in mind. The lesions associated with the secondary and tertiary stages of the disease are more common, and while no age is exempt, they are met with most frequently in patients between twenty and forty years of age.

(a) PRIMARY SYPHILIS.

A primary sore, or hard chancre, may occur on the lip, on the lining membrane of the cheek, on the tongue, or on the tonsil. It is rarely a venereal sore when found here, although it results from direct contact with the syphilitic virus. The lips may be infected by kissing, by the use of a pipe, drinking vessel, spoon, and the like, previously used by someone having syphilitic sores about the mouth, and

the poison so introduced may be carried towards the tonsils and pharynx by the buccal secretions. The infection has also been conveyed by imperfectly cleansed surgical instruments, such as tooth-forceps and tonsillotomes; and I have knowledge of a case where a tooth-brush was the means of conveying the infection, and of another where a young lady was infected through her sister's baby, the teat of whose feeding bottle she was in the habit of moistening in her mouth before putting it between the child's lips. The occurrence of cases like these should impress upon us the necessity of warning patients with syphilis not to use drinking vessels, spoons, towels, etc., likely to be used by others. Neglect of this precaution may lead to many members of a household becoming infected.

Symptoms.—The symptoms, which are usually trivial and depend largely on the site of the sore, may be ushered in with a sharp rise in temperature, followed by persistent one-sided sore throat. When the chancre is on the lip, it may cause discomfort in opening the mouth, if on the tongue or cheek, it may interfere with speech and mastication, and if on the tonsil it may cause pain on swallowing.

The sore is single, and circular in form; it has a hard, broad base, and on its surface there is inspissated mucus, and the edges are raised. The lymphatics on the affected side are enlarged at an early stage, though they are not particularly tender.

The sore is a persistent one, and, if not recognised and treated as syphilis, it will be followed by secondary syphilides.

Diagnosis.—There may be considerable doubt as to the true nature of the sore in the early stages. When situated on the lip, it is apt to be mistaken for herpes, but the base of the syphilitic sore becomes hard and broad, the glands become enlarged, and the sore does not respond to simple remedies. When on the tongue or tonsil, tubercular deposit,

gumma, and epithelioma may be thought of. But by the rapidity with which improvement follows the use of anti-syphilitic remedies, tuberculosis and malignancy may be readily excluded. Then enquiry should be made into the possible sources of infection. In some cases the diagnosis is only arrived at, when secondary symptoms have made their appearance.

(b) SECONDARY SYPHILIS OF THE FAUCES AND PHARYNX.

The lesions which occur in this stage are divided, in the order of their appearance, into general erythema, mucous patches, and erosions.

Erythema.—The earliest manifestation of constitutional syphilis is erythema of the palate and fauces. It is the first, and it is the most common, of the secondary symptoms.

This erythematous state of the palate and fauces resembles, in its early stage, the general injection associated with catarrh, with scarlet fever, and that resulting from the use of irritants and stimulants.

When the injection is of *catarrhal* origin it fades away gradually, after persisting for a few days, and the parts again resume their normal colour.

That resulting from the use of *stimulants* likewise disappears, after the cause has been removed.

The injection associated with *scarlet fever* is also general, affecting the whole surface equally, until it entirely disappears. Like the others it is bright red at first, but as time goes on it becomes dusky, or even livid, and, if unaccompanied by any deep tonsillar inflammation, it gradually subsides. (The age of the patient and the presence of the characteristic skin-eruption will, in the majority of cases, remove doubt as to the cause of the erythema.)

When the erythema is of *syphilitic* origin, the palate and fauces are at first uniformly red, but within three or four

days the redness becomes distinctly *limited*, limited in the great majority of cases to the anterior pillars and tonsils. Its distribution is *symmetrical*, and the injected area on each side has a *sharp line of demarcation*.

During this stage the tonsils are sometimes considerably swollen, as well as being deeply injected.

Mucous Patches.—The erythema is followed by the appearance of mucous patches, in some cases within a few days. Mucous patches are distributed, in the first instance, over the pillars of the fauces and over the tonsils. Later on they are met with at the angles of the mouth, on the lips and tongue, and over the lining membrane of the mouth generally. Sometimes they form on the alveolar mucosa around the last molar tooth, where the surface is apt to become eroded.

On the first appearance of these patches, which, as a general rule, is at the end of ten weeks after contagion, or six weeks after the appearance of the primary sore, they are of a delicate grey colour, with a glistening surface, closely resembling the slimy track left by a snail on a stone, or green leaf, over which it has passed, and thus they are at this stage sometimes spoken of as “**snail-tracks**.” Within a very short time, however, they become more clearly defined, each patch is elevated above the surface, is circular in outline, and the glistening appearance of the surface is lost; it becomes an opaque greyish-white patch, closely resembling a portion of a mucous surface to which solid nitrate of silver has recently been applied.

These mucous patches or “mucous plaques” are the papules of the general eruption, altered by the moisture of the surface affected, and the grey colour of the patches is due to swelling and death of their covering epithelium.

Erosions.—Where the patient is in low health, or where the adoption of appropriate treatment—medicinal, dietetic, and hygienic—has been delayed, the softened epithelium

covering the mucous patches is cast off, and ulcers result. These ulcers are of a very superficial character, and might more appropriately be termed "**erosions**," reserving "ulceration," as I prefer to do, for tertiary abrasions. Besides being shallow, they are irregularly circular in outline, frequently kidney-shaped; the edges are bright red, and the surface, which readily bleeds when exposed, is covered with yellowish-grey secretion.

Mucous patches and erosions on the fauces are, for the most part, symmetrical in their distribution over the two sides; they are coincident with the erythematous or roseolous rashes met with on the skin, and with the falling out of the hair. Their site is often determined by irritation. When alcohol, especially in its stronger forms, is used, the abrasions of the faucial mucous membrane may be very extensive; the use of the pipe, or the presence of a ragged tooth, will frequently lead to the formation of a mucous patch on the lip, on the tongue, or over the part of the cheek irritated, in one who has contracted syphilis; and an erosion may refuse to heal, or may increase in size, so long as the source of irritation persists.

Mucous patches and erosions, forming part of what are arbitrarily, though very conveniently, termed secondary symptoms, occurring in a patient who is otherwise in good health, and in whom there is no local irritant present, tend to disappear spontaneously at the end of six or eight weeks. This may occur even when no treatment has been adopted. This fact should be borne in mind, for as their presence is frequently unaccompanied by pain, the patient, when suffering from some later development of syphilis, may state, on being interrogated, that he never had "sore throat." Further, the mucous patch leaves no scar to indicate its former presence. When those symptoms of the early stage of syphilis have once completely disappeared, they seldom reappear in the same form, unless the general health is low,



Mucous patches of secondary syphilis distributed symmetrically over the fauces.

from poor feeding or from indulgence in alcohol ; and after a distinct period of immunity their recurrence is quite exceptional.

Associated with these early manifestations of constitutional syphilis, we occasionally have the tongue presenting a patchy appearance from the destruction of the papillæ over various parts of its dorsum. These "bald patches" are red in colour, are clearly defined, and stand out in marked contrast to the surrounding furred surface.

In other cases, in place of the papillæ being destroyed, they become hypertrophied, and appear as **warts** or **condylomata**, as was pointed out by Mr. Jonathan Hutchinson. In the former the papillæ are free and separate from each other, while in the formation of condylomata the hypertrophied papillæ become fused together by swelling of the intervening tissues, and they present a flat-topped, elevated area. These hypertrophies are most apt to occur on the dorsum, immediately in front of the circumvallate papillæ, possibly because it is the part of the tongue which, when at rest, is most exempt from pressure.

Symptoms.—*Erythema* may be unaccompanied by pain, so that its presence is often unknown to the patient, and consequently the attention of the surgeon may not be called to it. Usually, however, there is a sense of dryness, accompanied by discomfort or actual pain, and there may be swelling of the fauces and pharynx, with stuffiness of the nose and a varying degree of febricula.

Mucous patches, erosions and *condylomata* occasionally cause considerable pain, especially during mastication and deglutition; but it is often remarkable how little pain is complained of, in some cases where the tongue and fauces are extensively affected.

Diagnosis.—The diagnosis is based on a careful examination of the pathological changes seen in the buccal cavity, and on corroborative evidence on other parts of the body.

When the appearances are highly suspicious, doubt may be removed by asking some such question as "Where did you get this disease?"

Early diagnosis is of great importance, for it not only enables the patient to have the full benefit of being placed under appropriate treatment without delay, but, by the early adoption of precautionary measures, the further spread of the disease in a household may be prevented.

Patches of leucoma, a form of keratosis of the covering of the tongue and epithelium, which is described under a variety of terms—leucoplakia, psoriasis, etc.—are apt at first sight to be mistaken for mucous patches. Leucoma, however, is a very chronic affection, is accompanied by little or no local discomfort, and when examined with the finger the affected surfaces are found to be hard and rough, while the surface of the mucous patch is always soft to the touch.

(c) TERTIARY SYPHILIS OF THE FAUCES AND PHARYNX.

The lesions associated with the tertiary stage of syphilis are of a more serious character. They are usually single, and when multiple they are not distributed symmetrically, as secondary lesions frequently are. They are rarely seen within two years from the date of contraction of the disease; and in many instances they make their appearance only after a long interval of immunity from symptoms referable to syphilis. The patient's health, moreover, during the intervening years may have been excellent.

The forms in which the disease in this stage appears in the fauces and pharynx are:

- (1) Acute phagedænic inflammation;
- (2) Gummata;
- (3) Ulcers;

and these are followed by (4) cicatrices and deformities.

(1) **Acute Phagedænic Inflammation** may affect any part of the mouth or throat, and its occurrence is frequently traceable to the insanitary condition of the patient's surroundings. The parts affected become deeply injected and swollen, and rapid destruction of the area involved follows. By this acute inflammatory process the uvula, the soft palate, and other parts attacked, may slough and disappear within an incredibly short time.

(2) **Gummata**, which may be circumscribed, diffuse, or nodular in form, are localised swellings, and consist primarily of inflammatory products—granulation tissue with a delicate fibrous stroma. They are sometimes limited to the mucous membrane, though more usually they affect the deeper structures, and when they break down they lead to extensive destruction of the parts involved. The palate is their favourite site, but they may appear on the posterior wall of the pharynx, on the lateral walls of the pharynx, in the tonsils, the faucial pillars, and the larynx. The gumma may be slow of growth, or it may form rapidly; in either form it tends to break down. When of a chronic character, it is unaccompanied by pain, and it may under appropriate treatment become absorbed.

If the gumma is examined while in the inflamed state, it may appear as a smooth swelling, uniformly red, or the surface towards the centre may be livid. Within a few days the livid area becomes grey, indicating necrosis of the mucous membrane, and as this slough separates, it exposes a degree of destruction alarming to contemplate, the process having involved and destroyed the soft tissues, cartilage, periosteum, and bone. Thus when the gumma has been situated in the palate, a communication may be suddenly established between the cavity of the mouth and the interior of the nose.

(3) **Ulcers** resulting from tertiary syphilis are of two distinct kinds—superficial and deep ulcers.

The **superficial variety** chiefly affects the veil of the palate, and from this part the ulceration may spread to the faucial pillars and tonsils. These ulcers are irregularly circular in outline, and extend rapidly but not deeply, being confined



FIG. 64.—Extensive destruction of the hard palate, with the greater part of the soft palate unaffected.

to the mucous membrane, and submucous tissue. The surface of the ulcer is covered with ill-formed, watery pus mixed with mucus, and when this is wiped off with a swab or otherwise, the surface exposed is pale and irregular, from the presence of flabby granulations. The edges of the ulcers are injected, and bleed readily.

The **deep** or **perforating** ulcer follows the breaking down of a gumma; and in the resulting destructive process, not



A circumscribed gumma of the palate which has just broken down, and formed a small perforation extending through the bone as well as the soft tissues. The patient is 33 years of age, and is the father of the boy whose condition is depicted in Fig. 68.

only do the soft tissues suffer, but it may lead to the disintegration of cartilage, and necrosis of bone. It may invade any part of the palate, soft or hard, or the tonsil, the fauces, or the pharynx. In comparing these ulcers, which, though they occupy a comparatively small area superficially, penetrate deeply, with the superficial ulcers just described, the aphorism of Lancereaux, "that they gain in depth what they lose in extent," is frequently quoted.

Symptoms.—A gumma of the palate, fauces, or pharynx, and particularly if it be inflamed, will interfere with deglutition; and when ulceration occurs, the pain and difficulty is increased. If the gumma is attended by much swelling, speech may become thick and the voice flat; and if the ulcerative process leads to perforation of the palate, the patient's speech will become nasal in tone, and some portion of any fluid being swallowed will very probably return through the nose. Hæmorrhage may occur during the disintegration of a gumma.

Diagnosis.—In the majority of cases the diagnosis is easy.

Occasionally an acutely inflamed gumma of the tonsil may be mistaken for a quinsy. But the chief difficulties occur in connection with chronic ulcerative lesions, and in a few cases the diagnosis between syphilis, malignancy, and tubercle can only be arrived at after the examination of the discharge, the free administration of potassium iodide, and the microscopical examination of a portion of the diseased issue.

(4) **Cicatrices and Deformities.**—Tertiary lesions in the tongue, fauces, and pharynx are usually followed by some deformity. It may be a hard scar in the tongue, a perforation, or cleft, through the hard or soft palate or through both, loss of the uvula, or extensive cicatrices over the pharyngeal wall. Again, parts which normally are free from each other, may become united by adhesions, the faucial pillars on one or both sides may become fixed to

the pharyngeal wall at varying levels, or to the base of the tongue; the soft palate may become united to the posterior wall of the pharynx, or it may become bound down to the base of the tongue. The resulting conditions may affect, more or less seriously, the patient's speech, respiration, or deglutition.

II. SYPHILITIC AFFECTIONS OF THE LARYNX.

While the occurrence of a primary sore in the larynx is exceedingly rare, the **larynx** is affected by syphilis in many cases both in its **secondary** and **tertiary** stages.

(a) SECONDARY SYPHILIS OF THE LARYNX.

Erythema.—Where there are evidences of secondary syphilis on the fauces and pharynx, the laryngeal mucous membrane is frequently affected in a similar fashion. By over-use of the voice the hyperæmia may be aggravated, and it may be accompanied by swelling of the mucosa. At a later period, and while the laryngeal mucous generally remains red, the vocal cords may take on a mottled appearance, which may persist for a considerable time.

Mucous patches also appear in the larynx during the early stage of syphilis, although they occur here less frequently than on the fauces. They are in every respect similar to the patches met with on the fauces and pharynx, and their site is usually determined by some form of irritation, such as occurs during the passage of food, and by over-use of the voice.

Condylomata of the larynx occur in a fair proportion of patients suffering from syphilis, and are similar in appearance to condylomata on other mucous surfaces.

Erosions.—Just as erosions follow erythema and mucous patches in the fauces, so here they occur under similar con-

PLATE XIV.



Deformity of the palate, fauces, and pharynx following extensive and deep tertiary ulceration.



ditions. The erosion involves the mucous membrane alone, and where the free borders of the vocal cords are eroded, which are the parts most frequently affected, the edges of the cords become irregular in outline.

Symptoms.—The symptoms are those of laryngeal catarrh. There is the same sense of fulness, or swelling in the throat, with huskiness or aphonia, as is met with in simple catarrhal laryngitis, but in this instance the symptoms persist often over a series of months, and they do not yield to simple remedies, but do so to antisypilitic medication.

In some instances, although the lesions may involve a large area, and the parts affected may appear to be acutely inflamed, yet, to one's astonishment, there is almost complete absence of pain. Any discomfort complained of occurs chiefly while the voice is being used, or during the act of deglutition.

Except in cases where actual destruction of tissue has taken place, the voice is completely restored under appropriate treatment, although a vocalist may not always recover complete purity of tone, on account of localised sub-mucous thickenings which occasionally remain.

Diagnosis.—When the larynx is affected by secondary syphilis, there is usually some evidence of the existence of the disease in the fauces and pharynx. But if not, the mottled injection of the cords, the persistence of the sub-acute symptoms and the appearance of mucous patches and condylomata on the laryngeal mucosa will enable the diagnosis to be made.

That the secretions from secondary lesions in the larynx may convey infection should be borne in mind, and the surgeon, while making a laryngoscopic examination, should be careful to avoid being coughed upon by the patient.

(b) TERTIARY SYPHILIS OF THE LARYNX.

Active tertiary lesions in the larynx are usually met with in middle life. They rarely occur within three years from the date of infection, and in some cases they make their appearance only after long years of immunity from all evidences of syphilis. In many cases in which the disease has been contracted, no history of infection can be obtained, the secondary symptoms having been so slight as to escape observation. In other cases the lesions are the result of congenital syphilis.

Gummata and ulcerations are the two forms in which tertiary syphilis is met with in the larynx, and these active



FIG. 65.—Tertiary syphilis of the larynx. Multiple gummata which ended in necrosis of the cartilage, and extensive ulcers from the surface of which are granulation tissue outgrowths.

processes may lead to necrosis of the cartilaginous framework of the larynx, and subsequent deformity.

(1) **Gummata.**—While a gumma in the larynx tends to break down rapidly, yet in some instances it remains for a lengthened period as a well-defined swelling.

Gummata in their various forms may be met with on the epiglottis, the arytenoids, the ary-epiglottic folds, the ventricular bands and the vocal cords. They are usually in the form of diffuse swellings, of a deep red colour; and the

beginning of the softening process is indicated by the appearance of a yellow spot in the centre of the injected area. The sloughing which results may lead to extension and deep destruction of the soft tissues, and to necrosis of the cartilages.

(2) **Ulcers.**—These may be superficial or deep.

The **superficial** ulcer is rare, and when it does occur, it usually affects the epiglottis.

The **deep** ulcer, on the other hand, is the most common of the tertiary lesions met with in the larynx.

The deep ulcer results from the breaking down of a gumma. It is usually single, has a punched-out appearance, with sharp edges, and the mucosa surrounding it is usually red and swollen. Any part of the larynx may be the seat of a perforating ulcer, and in the ulcerative process, the epiglottis may be notched or wholly destroyed, part or whole of a vocal cord may be lost, or extensive necrosis of the cartilaginous framework of the larynx may result.

The rapidity with which the tissues are infected, and the extent of the destruction which follows, is in some cases so great as to suggest the existence of a malignant form of syphilis. The apparent "malignancy," however, may be found to depend either on the severity of the infection, or upon the inability of the tissues, reduced by starvation or sodden by drink, to resist the inroads of the disease.

Symptoms.—The symptoms associated with the presence of a gumma depend chiefly on its size and situation, and whether it be inflamed or not. Pain is not usually a prominent feature.

A gumma on the epiglottis may cause difficulty in swallowing, and it may render the speech guttural. Voice and respiration may both be affected by gunmata within the larynx, should they be so situated as to interfere with the movements of the cords, or with the patency of the glottis.

When ulceration has occurred there may be pain, particularly of the lip of the epiglottis, or the arytenoid prominences be affected. When the cords are ulcerated, the voice will be rough and hoarse, or there may be aphonia, and blood-stained muco-pus may be expectorated. Where exuberant granulations form on the surface of the ulcer, suffocative symptoms may ensue. Where there is perichondritis or necrosis, the soft tissues around become markedly œdematous, and there is an abundant mucopurulent foul-smelling discharge. The cicatrisation which follows the healing of an ulcer may seriously impair the voice, or may so narrow the glottis as to impede respiration.

Extensive ulceration in the interior of the larynx may be followed by great distortion of the organ, so that the relations of various parts to each other may be entirely lost, and from the adhesion of opposing surfaces, the air-way may be so narrowed as to endanger the patient's life. Ulceration in the subglottic region may be followed by serious stenosis, which, as seen in coloured plate, may occur while the upper part of the larynx is unaffected and the movements of the vocal cords unimpaired.

Diagnosis.—As in the fauces, the diagnosis of tertiary lesions of the larynx is usually easy.

A gumma may be mistaken for a new-growth, but on close examination, a gumma is seen to be a localised tumefaction and not an out-growth, and the diagnosis will be rendered more certain by a history of syphilis, or the discovery of other evidence of the disease.

It is sometimes difficult at a first examination to differentiate between a syphilitic, a tubercular, and a malignant ulcer in the larynx. The tertiary ulcer has usually a punched-out appearance, sometimes with undermined edges, and its surface is covered with muco-pus. The possibility of tubercle may be excluded by examination of the sputum,

a careful examination of the chest, and by a record of the patient's morning and evening temperatures.

Malignancy may be excluded by the effects of the administration of iodide of potassium, and if considered necessary by the removal and careful microscopic examination of a portion of the affected tissue.

Prognosis.—In the great majority of cases of syphilis of the fauces, pharynx, and larynx, the prognosis is good, as far as the preservation of life is concerned. If the patient is placed under appropriate treatment in the early stages of the disease, its further progress may be checked, and resolution of the disease may be obtained without the occurrence of any serious damage. In advanced tertiary lesions, while the further progress of the disease may be checked, and ulcers may be healed, by treatment, permanent deformities may result. Thus perforations and cicatrices may remain; the voice may be permanently impaired; and in cases of laryngeal stenosis it may be necessary for the patient to wear a tracheotomy tube for the rest of his life.

III. SYPHILIS OF THE TRACHEA.

While **secondary** lesions are present in the larynx, the tracheal mucosa may become inflamed and swollen, but under appropriate internal treatment the inflammatory process will subside as the erythema and the mucous patches on the fauces and in the larynx disappear.

Tertiary lesions, occurring in the forms of ulceration of the trachea, are much less common, but they do occur, and they sometimes lead to dire results.

In the *British Medical Journal* for October 14, 1899, I recorded three cases, in each of which the nature of the ulceration was verified on *post-mortem* examination. On account of their rarity, a few of the salient points may be given.

In none of the three cases was there any lesion of the fauces or pharynx. In only one was the larynx involved, and in it the ulceration had been extensive, and had resulted in serious stenosis of the larynx; in the same case there was a perforation of the soft palate. In another case there had been extensive destruction of the septum narium; while in the third case neither the palate, the nose, nor the larynx had suffered.

In the first case, a man of 40, there was extensive destruction of the bony septum, apparently syphilitic from its appearance and the history given. Tracheal "tugging" was present to a distinct degree, and he had frequent attacks of alarming dyspnœa. Both vocal cords moved freely and equally, and his voice was unaffected. On laryngoscopic examination the trachea was seen to become distinctly narrow at about an inch above the bifurcation, and the anterior wall of the trachea at this level was seen to pulsate. The patient died of suffocation, which both intubation and tracheotomy failed to relieve.

At the *post-mortem* examination the aorta was found to be atheromatous, and intimately adherent to the trachea. On the anterior aspect of the inner wall of the trachea there was an ulcer, the area of which was something less than a sixpence, beneath which portions of two cartilaginous rings were absent. The lining membrane of the trachea, from this level upwards for a distance of nearly two inches, was replaced by scar tissue, and similar cicatricial tissue was found to extend for nearly one inch into each bronchus. At the level of the bifurcation there was a sudden and distinct narrowing of the trachea, due to contraction of the cicatricial tissue which marked the site of healed ulcers.

In the second case, a girl of seventeen, the evidence of the specific dyscrasia was manifested by a perforation through the soft palate, with ulceration and stenosis of the larynx.

In the specimen (Fig. 66) the interior of the larynx is represented by a ragged contracted cavity with ulcerated



FIG. 66.—Extensive laryngeal and tracheal stenosis consequent on syphilitic ulceration.

walls. The epiglottis and vocal cords were hardly recognisable, being in great part destroyed, and the trachea below was contracted and ulcerated for a distance of 3 cm. The narrowing of the lower central portion was extreme,

which may be realized when that portion is compared with the normal trachea above and below.

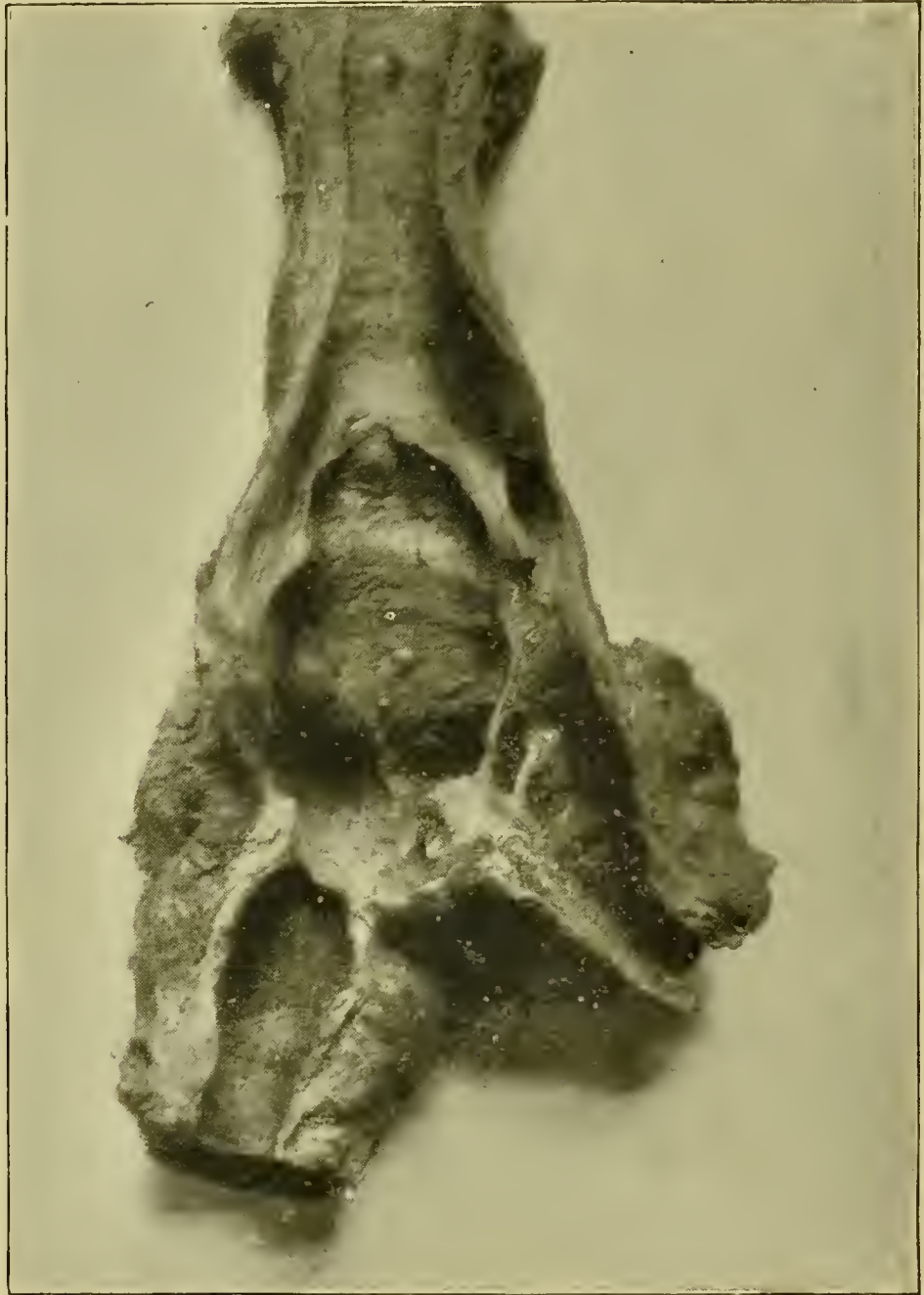


FIG. 67.—Extensive and deep syphilitic ulceration of the trachea and bronchi.

In the third case there was no history and no stigmata of syphilis, and the question of specific disease was not raised during life. The *post-mortem* appearances are shown in Fig. 67. The ulceration was extensive, affecting the lower part of the trachea and the two main bronchi, and

although its character was seen to be peculiar, and evidently due to an infective cause, the presence of gummata in the liver showed it to be certainly syphilitic.

The **diagnosis** in those cases is to a large extent arrived at by a process of exclusion. Examination of the chest will exclude many possibilities, and the use of the laryngoscope will not only show that the cords are not involved, but may reveal something of the actual tracheal lesion.

The **prognosis** is always grave. The perils of the patient are not removed when the ulcer heals; they are rather altered in their character. The healing process is slowly followed by contraction of the scar tissue, and this leads to a gradual narrowing of the lumen of the trachea.

Treatment.—When the contraction occurs at a high level, a low tracheotomy may serve to ensure the patency of the air-way, and the preservation of life; but when it occurs low down, one must depend wholly on the help obtainable from the administration of anti-syphilitic remedies.

IV. INHERITED SYPHILIS.

Lesions in every respect similar to those which follow acquired syphilis are met with in children of syphilitic parentage.

Secondary Lesions.—Lesions corresponding to those of the secondary stage are chiefly met with in the nose in infants. The resulting condition is spoken of as “snuffles,” and while the child is so affected there may be erythema, and sometimes mucous patches, of the fauces and pharynx, and occasionally, though more rarely, the larynx may be similarly affected.

Tertiary Lesions.—Gummata are rarely met with in children under three years, and they appear most commonly about the age of puberty. They occur more frequently in the palate and pharynx than in the larynx.

The gummata which form here resemble in every respect those resulting from acquired syphilis. Their progress may be slow, there may be complete absence of pain, but they



FIG. 68.—Perforation of the hard palate and destruction of the nasal septum, etc., the result of inherited syphilis. The boy, who was 7 years old, was the offspring of the man whose palate is shown in Plate XIII.

tend to break down, lead to extensive destruction of tissues, and subsequent local deformity.

In the larynx, gummata and ulcers are followed by contractions, adhesions, and stenosis as in the acquired form.

The disease in another phase may sometimes be encountered. A patient in middle life develops a swelling in

the larynx which, breaking down slowly or rapidly, results in considerable destruction of tissue, followed by extensive cicatrization on healing. He denies having suffered from venereal disease at any time, is without history of secondary symptoms, and bears no evidence of primary sore or glandular enlargements.

From the appearance of the initial swelling, the rapidity of the destructive process, the character of the resulting ulcer, and the marked contraction of the cicatrices, I consider such a case to be syphilitic in nature, and if reliance can be placed on his statements, it is in all probability a late development of the inherited disease, although it constituted in him the first-observed lesion.

Symptoms.—In infancy the child has “snuffles,” and when the throat is implicated there is a harsh weak voice. If there is much swelling of the mucosa there will be dyspnoea and, possibly, symptoms suggestive of laryngismus. When gummata are present, speech, respiration, and deglutition may each be affected, and fluids, while being swallowed, may return through the nose, on account of gummatous swellings of the palate, paresis of the palate, or perforation of it.

Diagnosis.—In infants there are usually other signs of syphilis, on the mucous membranes or on the skin, and particularly on the nates and around the anus.

In adolescents, the sufferer bears other evidences of the inherited taint, as a rule, such as notching of the permanent central incisors (“Hutchinson’s teeth”), interstitial keratitis, etc.

TREATMENT OF SYPHILIS.

The syphilitic affections of the fauces, pharynx and larynx which have been described must always be considered in their constitutional aspect, and they should never be treated simply as local lesions.

Local treatment may or may not be necessary ; constitutional treatment must be adopted in every case. As opposed to this statement, however, the practice of the late Sir Morell Mackenzie may be quoted. In his *Diseases of Throat and Nose*, vol. i., page 93, he says : " Secondary syphilitic affections of the pharynx do not usually require any constitutional remedies. For the last eighteen years I have seldom employed any specific treatment for adults. Under the use of local remedies the symptoms rapidly disappear, and I have rarely met with tertiary phenomena in the throat amongst those whom I previously treated for the earlier manifestations. Hence it is probable that the non-use of mercury does not increase the risk of a further development of the disease." With all deference to his authority, his teaching on this point must be considered to be most dangerous. Fortunately it is now supported by few. The argument on which it is founded is not only incomplete but erroneous. As has been pointed out, secondary manifestations in the mouth and fauces, when the parts affected are free from local irritation, disappear *spontaneously* at the end of six, eight, or ten weeks, but the disease of which they are symptoms remains uncurbed.

Treatment then is divided into Constitutional and Local remedies, and these are subdivided into Medicinal, Dietetic, Hygienic, and Operative measures.

(1) **Constitutional.**—Of late years the experience of members of the profession in this country has led them to the conclusion that the syphilitic poison can best be combated by preparations of *mercury* and by the *iodide of potassium*, the former being most useful in the early stages, the latter in the late manifestations of the disease. The induration around a hard chancre disappears rapidly under the influence of mercury ; and by its early exhibition secondary symptoms are distinctly modified, and may be averted. Similarly under the iodide, tertiary deposits dissolve and become absorbed, and

tertiary ulcers are rendered healthy and are encouraged to heal.

Authorities are divided as to the relative efficacy of the various preparations of **mercury** and the best method of administering the drug. Mr. Hutchinson recommends Hydrargyrum cum cretâ as being the most constant and least variable of all mercurial preparations. He employs it in the form of pill, each containing one grain; and where the grey powder excites bowel irritation, it is combined with one grain of Dover's powder. One pill should be taken by the patient four times a day, or more frequently if called for. Plummer's, or the compound calomel pill (*Pilula hydrargyri subchloridi composita*), is preferred by many, who prescribe it in a dose of five grain doses twice daily.

The bichloride of mercury in solution is largely employed, and this I prefer in dispensary practice, in a measure because it can be quickly and accurately dispensed, and the dose is easily regulated by taking a larger or smaller quantity of a standard solution. The B.P. solution (*Liquor hydrargyri perchloridi*) contains one-sixteenth of a grain in each drachm; but in prescribing it I prefer the solution freshly made, and I prescribe with it a small proportion of iodide of potassium, which, besides ensuring complete solution of the sparingly soluble mercuric salt, appears to render the mercury more active in combating the disease in the early secondary stage, in many cases. Again, where mucous patches are numerous, a condition usually associated with a copious papular eruption over the skin generally, the addition of arsenic in solution will be found to be advantageous; although it must be remembered that the exhibition of general tonics sometimes enables the system to resist the action of mercury. *Per contra* the influence of mercury is most readily exerted, and becomes rapidly evident, when the patient is debilitated, is kept in bed, and on low diet.

In addition to these and other mercurial preparations

which may be administered by the mouth, mercury may be given by hypodermic, or by intra-muscular, injections, by fumigation, or by inunction.

Hypodermically the perchloride of mercury may be used, simply dissolved in water, or with a small proportion of glycerine and iodide of potassium added. Bloxham of the London Lock Hospital recommended its use in doses of $\frac{1}{60}$ of a grain per day, or $\frac{1}{3}$ of a grain at one injection, once per week, while Lewin of Paris recommended daily injections of from $\frac{1}{12}$ to $\frac{1}{8}$ of a grain. The bichloride, preferred by many, may be given daily in doses of from $\frac{1}{16}$ to $\frac{1}{8}$ of a grain.

Recently, Lambkin, after an extended use of **intra-muscular injections** of metallic mercury, has strongly recommended this method of administering the drug. He uses it in the form of a cream made with lanolin and carbolic liquid paraffin, having 1 gr. of metallic mercury in every ten minims of the cream. One injection of ten minims is given once a week.

When giving mercury by injection, strict antiseptic precautions must be observed. The needle should be inserted deeply, and the injection made slowly, into the gluteal muscles, never into the subcutaneous cellular tissue. The action of the drug thus administered is more rapid than when given by the mouth, and it is of most service where deep ulceration has taken place at an early stage of the disease. The disadvantages of this method are that it necessitates frequent medical attention. When the perchloride solution is used, the injection is sometimes followed by considerable pain, which may last for hours, and by the occasional formation of abscess.

Fumigation though active is now seldom employed.

Inunction is used in this country chiefly in the treatment of children, or in adults when the internal administration of mercury gives rise to gastro-intestinal irritation. The fame of Aix-la-Chapelle as a resort for the cure of syphilis

depends largely on the thoroughness with which treatment by inunction is carried out.

For the successful treatment of tertiary lesions of the tongue, palate, fauces, pharynx, and larynx, **iodide of potassium** is chiefly relied upon. Under its specific influence recent gummata become absorbed, or, where this does not take place, their destructive action is modified and limited, and foul ulcers assume a clean and healthy appearance. In using iodide of potassium for the treatment of syphilis it will be found that, in the great majority of cases, the beneficial specific influence of the drug is obtained from comparatively small doses, doses varying from 3 to 5 grains, repeated three or four times a day. Larger doses are but rarely called for, and should not be given without good reason. When it appears necessary to increase the dose it is often well to combine this salt with the iodide of sodium, or the iodide of ammonium along with aromatic spirits of ammonia. By such means the depressant action of the potassium salt is minimised, the patient is saved a large amount of discomfort, and the full effect of the drug is obtained. The iodides are as a rule best borne by those whose general health is good, so, when the patient is anæmic, iron in the form of the citrate of iron and ammonia may be advantageously combined with it. The combination of this preparation of iron with the iodide of potassium is to be preferred to the syrup of the iodide of iron.

In cases where the depressant action of the iodides is severe and persistent, and in those cases where the tertiary phenomena do not appear to be readily controlled by their use, iodipin may be used, or a return may be made to some of the mercurial preparations already referred to. Where the iodides excite gastric disturbances, the use of a preparation of pepsin along with iodide may obviate the discomfort.

(2) **Local**.—Though local medication must be looked upon as secondary to constitutional treatment in all syphilitic

lesions of the mouth and throat, yet local applications should never be neglected, for by them discomfort and pain may be removed, and necrotic inflammatory processes may be controlled, and tissue-destruction prevented.

In the early *erythema* of the palate and fauces a single application of a solution of nitrate of silver (15 grs.— $\bar{3}j$) always relieves and, frequently, completely removes the discomfort and irritation complained of. Should the injected condition persist, the use of cocaine in the form of lozenge is grateful to the patient, and removes the superficial congestion.

When *mucous patches* are present and painful, or where the surface has become eroded, local applications are called for. Solution of nitrate of silver (20 grs.— $\bar{3}j$), or of sulphate of copper (30 grs.— $\bar{3}j$), may be employed with advantage, or a solution of chromic acid (1 in 6) may be used, carefully confining the application of the pigment to the affected area. This, in my opinion, is the most satisfactory local remedy, and the comfort experienced by a patient after a single application, as well as the rapidity with which an erosion heals after such an application, are often surprising.

When a *gumma* is present, painting the swollen surface with Lin. iodi. is sometimes of service, but care must be taken not to irritate the surface by severe or too frequent applications.

In the local treatment of *tertiary ulcers* it is necessary, in the first place, that the parts be kept thoroughly clean. This may be accomplished by swabbing with hydrogen-peroxide or by the use of a mouth-wash or gargle containing some antiseptic, such as carbolic acid, chlorate of potash, permanganate of potash, etc., in solution. After the surface has been cleansed, if the ulcer is indolent and comparatively superficial, it may be stimulated by various pigments, such as solution of chloride of zinc, nitrate of silver (weak), sulphate of copper, or chromic acid. When the destruction is

extensive or deep, and in those cases where the ulcer is spreading, the action may be checked in most cases, and a healthy condition of the part induced, by the application of a stronger solution of chromic acid in water (1 in 3). This has a remarkably good effect in inducing a healthy action in deep foul syphilitic ulcers.

(3) **Dietetic and Hygienic.**—It is of considerable importance, both for the comfort of the patient and to obtain the best results from medicinal treatment, that everything which might cause irritation or inflame the parts should be carefully avoided. Thus, while the palate, fauces, or pharynx are inflamed, the diet should be bland in character, spiced and hot foods should be specially avoided, and the use of both alcohol and tobacco must be strictly forbidden. When the larynx is affected the voice should be used very sparingly. Where there is much swelling of the parts, giving rise to difficulty in deglutition, or where, from loss of tissue, such as perforation of the hard palate or destruction of portions of the soft palate, fluids, while being swallowed, return in part through the nose, deglutition may be rendered much more agreeable, and the taking of food an easier task, by having it prepared in a semi-solid form. Farinaceous food, such as arrow-root, of the consistence of stiff paste, is readily swallowed by those who cannot take fluids, like milk or soups, without a large proportion returning through the nose. After each meal the patient must thoroughly cleanse his mouth by rinsing with a solution of chlorate of potash, borax, or the like; and every care must be taken by him, so long as there are any abrasions of the lips and tongue, to avoid all risks of communicating the disease to others. While taking mercury, patients should abstain from fruit, fresh vegetables, tea, and coffee, as these are apt to cause intestinal irritation and diarrhœa.

(4) **Operative.**—Under certain circumstances it becomes necessary to resort to surgical measures to prevent the

patient being suffocated or to enable him to partake of food. During the presence of extensive ulceration, for instance, œdema glottidis may supervene, and tracheotomy may be called for. Following extensive ulceration, the palate, fauces, and pharynx may become bound together, so that not only may all communication between the buccal and nasal cavities be cut off, but the faucial isthmus may be so narrowed as to interfere with alimentation.

In all such cases one should rarely be tempted to enlarge the isthmus by the use of the knife, as from contraction of the resulting cicatrices the patient's subsequent condition is often aggravated. Where contraction is extreme, the parts may be dilated by stretching in various ways; and where respiration is interfered with, the trachea should be opened, previous to any attempts at dilating the faucial cicatrices. The inconvenience of a perforation in the hard palate can be readily overcome by an obturator where the opening is small, and a vulcanite or metallic plate may be readily adapted by a dentist when the destruction of tissue has been more extensive.

A perforation or a cleft, the result of syphilitic ulceration, may be closed by a flap operation, after the patient has undergone a full course of medicinal treatment, provided that the parts around the perforation are healthy.

Where there is narrowing of the calibre of the larynx following extensive ulceration, or where, from destruction of some part of the cartilaginous framework, the larynx has become distorted and respiration difficult, an O'Dwyer's tube of appropriate size may be inserted. Should its presence cause much discomfort, or tend to produce ulceration of the surface, it should be withdrawn, the trachea opened, and an ordinary cannula inserted. It may be necessary for the patient to continue to wear an appliance of this sort for a series of years, the length of time depending wholly on the state and patency of the larynx.

CHAPTER XV.

TUBERCULOSIS.

I. TUBERCULOSIS OF THE FAUCES AND PHARYNX.

TUBERCULOSIS of the Fauces and Pharynx is not common. In some very exceptional instances those parts may be affected primarily, by which is meant, that either there has been a direct tuberculous infection of the part, or that no other evidence of tuberculosis can be discovered in the lungs or elsewhere. In most cases the tuberculous lesion is not only secondary to pulmonary tuberculosis, but occurs chiefly in the later stages of phthisis.

Etiology.—Though authors are by no means agreed as to why the pharynx should become so affected, the explanation may be found in the frequently repeated cough which is associated with pulmonary phthisis. The incessant cough leads to deep injection of the pharyngeal wall, and during each cough the sputum, laden with tubercle bacilli, is thrown violently against this inflamed, and not infrequently eroded, mucous membrane, with the result that the surface becomes inoculated.

Tuberculosis of the pharynx occurs, almost invariably, in adults, and it may be in the form of (1) Acute miliary tubercle, (2) Tuberculous ulceration, or (3) Tuberculous infiltration.

(1) Miliary tubercle of the fauces and pharynx is always associated with miliary tuberculosis of the lungs. The soft palate, with the uvula and faucial pillars, is chiefly affected, and the disease appears in the form of numerous small deposits in the submucous tissue. Round cell infiltration, and the formation of giant cells occurs, followed by a rapid ulcerative process, and, by the coalescence of neighbouring ulcers, large irregularly shaped ulcers result. While these spread, they remain superficial, and have little tendency to destroy the deeper structures. The edges of the ulcers are inflamed and undermined, the soft palate and uvula are pale and œdematous, and the cervical lymphatics become enlarged and painful.

(2) The tuberculous ulceration may either follow the necrotic process in miliary tubercle, or it may occur in a much less acute form, and as a discrete ulcer. The ulcer is usually covered with greyish ropy muco-purulent secretion, on the removal of which, by swab or otherwise, a surface composed of unhealthy granulation tissue is exposed. In the less acute cases tissue formation, by exceeding the rate of tissue destruction, may result in the formation of nodular granulomatous outgrowths, which may be so bulky as to hide the ulcers from which they spring.

(3) Tuberculous infiltrations are occasionally met with in the posterior faucial pillars and on the lateral walls of the pharynx. They are of a very chronic character, they possibly result from infection of the superficial glands, and the resulting granular elevations resemble those associated with lupus.

Symptoms.—The subjective symptoms are those of pulmonary phthisis, with which pharyngeal tuberculosis is almost always associated. But, in addition to cough, muco-purulent expectoration containing tubercle bacilli, loss of appetite, loss of flesh, night-sweats, evening-exacerbations of temperature, etc., there is complaint of constant pain, or a sense of raw-

ness in the throat, which is often much greater than the appearance of the parts lead one to expect, and this pain is greatly increased on swallowing. This point is an important factor in prognosis, as from the great pain which accompanies the act of deglutition, the patient is unable to take the requisite amount of nourishment, and thus he becomes exhausted much more rapidly than in uncomplicated pulmonary phthisis.

In the more chronic cases, pain on swallowing, and accumulation of viscid mucus, which is difficult to dislodge, with fetor of the breath, are the chief symptoms.

Diagnosis.—Although there are several points of marked difference between tubercular and syphilitic ulceration of the pharynx, the former is apt to be mistaken for the latter. The presence of high temperature, the extreme, and almost characteristic, pain on deglutition, which shoots sharply up to the ears, the condition of the lungs, and lastly, the demonstration of tubercle bacilli in the secretions which cover the surface of the ulcer, will remove all doubt as to the nature of the ulcers.

Prognosis is always unfavourable, and the rapidity of a fatal issue depends largely on the degree of dysphagia in any given case.

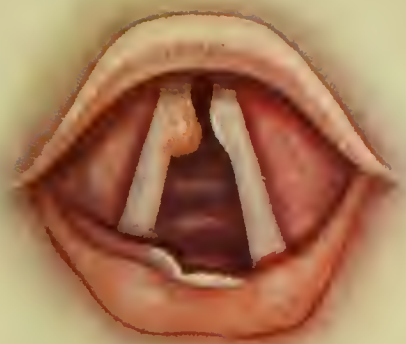
Treatment may be summed up in a few words. It comprises:—(1) Rest of the part affected; (2) a plentiful supply of suitable nourishment; (3) local applications for the relief of pain and to stimulate the healing process; and (4) the choice of a suitable climate, all of which will be considered more in detail under “Laryngeal tuberculosis.”

II. TUBERCULOSIS OF THE LARYNX.

Tubercular Laryngitis, or phthisis laryngea, is much more frequently met with than tubercular disease of the fauces and pharynx, and in the great majority of cases it occurs secondarily to pulmonary tuberculosis. That tuberculosis

ever occurs primarily in the larynx is denied by some and questioned by many; but all are agreed that cases occur where tubercular disease is seen in the larynx before its presence can be detected in the lungs. Those who deny that tubercle ever affects the larynx primarily, say of such cases that tubercle is present in the lung in all, though it may not be discovered even by a careful physical examination. The portion of lung involved may be comparatively limited, the lesion situated deep in the substance of the lung, or of such a chronic character as to cause no change which can be detected by the physician. It is difficult to deny this allegation, and especially in face of the fact that in almost every case of laryngeal tuberculosis where death has occurred and a careful *post-mortem* examination has been made, it has been found that when true tubercular ulceration of the larynx existed, the lungs bore evidence of tubercular disease; and not only so, but the lesions found there appeared to be of longer standing than those met with in the larynx.

But though the disease is seldom, if ever, confined to the larynx, when the parts are examined *post-mortem*, owing to the infrequency with which tubercular laryngitis alone causes death, yet a fair number of cases are met with where true tubercular laryngitis is present without pulmonary implication, or at least where the pulmonary involvement is so slight as to baffle detection. When we think of the situation of the larynx, we should expect primary tubercular laryngitis to be of frequent occurrence, rather than an exceptional condition. The larynx, from its comparatively superficial position, is exposed to, and readily influenced by, changes in temperature. All air inspired passes through the larynx, and, as a result, its lining membrane must be influenced by the condition of the air as regards temperature, humidity, and presence of impurities. The readiness and frequency with which the parts become congested by the prolonged



(a)



(b)



(c)



(d)

FIG. (a).—Laryngeal phthisis with granuloma on the right vocal cord, with an inter-arytenoid ulcer.

FIG. (b).—Acute laryngeal tuberculosis, with considerable oedema of the epiglottis and the arytenoids.

FIG. (c).—Lupus of the larynx. Portion of the epiglottic cartilage has been destroyed, and there is a large granuloma springing from the inter-arytenoid membrane.

FIG. (d).—Syphilis of the larynx in which extensive sub-glottic ulceration was followed by serious stenosis.

or forcible use of the voice, or by inflammation of the structures immediately surrounding it, the occurrence of which is a matter of daily experience, tend to produce sub-acute congestions and inflammations, which in those of the tubercular diathesis might be expected to become the seat of tubercular deposit, resulting in a true tubercular laryngitis.

The cases in which tubercular laryngitis occurs prior to, and apart from, implication of the lungs, are very rare.

The larynx, on the other hand, is affected in a very large proportion of patients suffering from pulmonary tuberculosis. The affection of the larynx, however, is not necessarily tubercular, as a patient, while suffering from pulmonary phthisis, may contract a simple catarrhal laryngitis, which under appropriate treatment will get well. Schäffer, in reporting the results of a laryngoscopic examination of 310 persons suffering from pulmonary tuberculosis, stated that in eight cases only did he find the larynx normal, while Sir Morell Mackenzie found in the examination of 100 phthisical patients, 29 in whom the laryngeal mucous membrane appeared to be normal, and in the remaining 71 he found organic changes present in the larynx.

The percentage of cases in which laryngeal ulceration has been found in the *post-mortem* examination of those who had died from pulmonary phthisis given by different authors also varies between those of Willigk, with 13·8 per cent. in 1317 cases, and Heinze, with 30·6 per cent. in 1226 cases examined.

Laryngeal complications in patients suffering from pulmonary phthisis are more frequent in men than in women, and are more common between the ages of twenty and thirty, than in earlier or later life.

As tuberculosis of the larynx is almost always secondary to phthisis pulmonalis, the infection is conveyed in the majority of cases by the bacillus-laden sputum coughed up from the lungs, and which is frequently harboured in the

ventricles. Infection will be favoured by the presence of any local inflammatory process, and by abrasions. Jobson Horne has shown that the bacilli may also gain access to the lymph spaces through the ducts of the glands. The disease-process starts in the lymphatics, and, having gained an entrance, the early changes which follow consist of a cell proliferation around the lymph-channels. Thus the earliest evidences of tubercular disease in the larynx are to be found where lymphatics are most abundant, such as in the inter-arytenoid region, and around the arytenoids and epiglottis.

Tubercular Lesions.

The manifestations of tuberculosis within the larynx vary greatly, and the lesions may be acute or chronic in character.

(1) Of the acute lesions, **miliary tubercle**, though very rare, must be mentioned. Like miliary tuberculosis of the pharynx it is part of an acute tubercular infection. Numerous small rounded deposits form in the laryngeal mucosa, and these tend to break down rapidly, and the resulting small ulcers coalesce to form extensive ulcers of irregular shape.

(2) **Infiltrations**.—These may be either localised or wide-spread. The localised infiltrations are usually intrinsic and affect the vocal cords and ventricular bands chiefly. They are less acute, they break down less rapidly, and they are accompanied by less œdema than the wide-spread infiltrations. These latter make their appearance over the arytenoids, the epiglottis and the ary-epiglottic folds. As the infiltrations increase in size, œdema sets in, and this may seriously alter the form and appearance of the larynx.

(3) **Ulcers**.—Where the isolated tubercles, or the areas of infiltration, break down, ulcers result. These at first may be small and superficial, but they slowly extend both in area and in depth, and as the ulcerative process advances, it is

attended by an increasing amount of œdema. Later, the perichondrium becomes invaded, and the process may end in necrosis and exfoliation of the cartilages. In acute perichondritis, the swelling of the tissues associated with the formation of pus may be so great as to threaten suffocation, and necessitate the opening of the trachea.

(4) **A localised tumour formation** is met with as a chronic laryngeal lesion in phthisical patients. The most common form is a pyramidal outgrowth springing from the laryngeal aspect of the inter-arytenoid membrane. It is pale in colour, frequently œdematous, smooth on the surface, and having a base which often occupies the greater part of the space between the two arytenoid cartilages. Usually it is of the nature of a granuloma, springing from an ulcerated surface, and it may, if the patient's health remains fairly good, persist unchanged for months or even years. In exceptional instances it becomes ulcerated, while in other cases it may disappear under treatment.

The **symptoms** associated with tubercular affections of the larynx vary according to the stage of the disease, the parts involved, and the severity of the local process. They may be considered as follows.

(1) **Alterations in the Voice.**—**Fatigue, hoarseness, aphonia.**—Interference with the vocal function is present in varying degrees in 90 per cent. of all cases of laryngeal phthisis.

At a very early stage the patient finds that, after comparatively slight use of the voice, there is a sense of **fatigue** of the larynx, accompanied by a slight degree of **huskiness**, and, should the patient persist in using the voice, whether it be in speaking or in singing, or should much effort be made to clear the voice by coughing, the **hoarseness** increases. As the local manifestations of the disease become more pronounced, the voice is more seriously interfered with, and from occasional huskiness it may proceed to persistent hoarseness or complete loss of the voice—**aphonia**.

The causes which lead up to such a result are various. It may begin as an anæmic, atonic state of the mucous membrane of the vocal cords, followed by a laryngeal catarrh, which, when associated with the tubercular state, is of a persistent character; fulness of the ventricular bands; infiltration of the inter-arytenoid fold; swelling or ulceration of the vocal cords, or impairment of their movements by inflammatory exudation.

(2) **Cough**, which depends greatly on the condition of the lungs, is, in the early stage, neither a characteristic symptom, nor is it constantly present. As the disease advances the cough becomes more troublesome, and, in the later stages, violent and exhausting paroxysms are not infrequent.

(3) **Expectoration**, at first mucous in character, becomes muco-purulent, and, where the surface is ulcerated, it may be streaked with blood. The expectorated matter will, on careful examination, be found, in the majority of cases, to contain tubercle bacilli. As the ulcerative process advances, there may be incomplete closure of the glottis during coughing, which combined with the reduced state of the patient's strength makes the effort of coughing most exhausting and the dislodgment of the discharges very difficult, and sometimes impossible. Occasionally the cough ends in vomiting.

(4) **Dyspnœa**.—Shortness of breath is present to a varying degree in the advanced stages of all cases, and is largely due to the condition of the lungs; but dyspnœa may occur at an early stage, may indeed be among the first symptoms, as a consequence of the laryngeal affection. When this is the case, the respiratory difficulty is almost always due to œdema of some part of the larynx, it may be of the epiglottis, of the arytenoids, or ary-epiglottic folds, of one or other ventricular band, or the œdema may be in the subglottic region.

(5) **Dysphagia**.—Deglutition is interfered with in about one-third of all cases of laryngeal phthisis. The difficulty is at first due to pain. The pain shoots from the throat up to the ear during the act of swallowing; and this **odynphagia**, which is due to the inflamed state of the larynx, or the presence of ulcers, is occasionally so severe as to seriously interfere with nutrition.

Dysphagia proper is usually a late symptom, and the difficulty or obstruction is due to swelling—infiltration or œdema—in connection with the epiglottis, or the arytenoid prominences. In more advanced cases, where, on account of swelling or from destruction of tissue, the opening of the larynx is not sufficiently protected during swallowing, a portion of the food, on its way to the œsophagus, may enter the larynx, and excite paroxysm of coughing, or dyspnœa. On the other hand, it is astonishing to observe, in some cases, how the parts accommodate themselves to the new order of things, and to note with what ease, or rather complete absence of discomfort, a patient can swallow, after a large portion of the epiglottis has been destroyed by ulceration. Destructive ulceration is of much more common occurrence, however, in syphilis, than in tuberculosis. Where imperfect closure of the larynx from this cause exists and interferes with deglutition, it is well to bear in mind the ease with which semi-solids are swallowed, compared with either fluids or solids.

(6) The **general symptoms** which are associated with, and characteristic of, pulmonary tuberculosis are present in laryngeal phthisis, and they are intensified where dysphagia is a marked feature. Where there is dysphagia general nutrition is quickly affected, and with the rapidity of the wasting process the various symptoms indicative of bodily exhaustion supervene at an early stage of the disease. Thus laryngeal tuberculosis, which, at its commencement may appear so slight as to make the diagnosis doubtful, frequently proves

much more rapidly fatal than those cases of pulmonary phthisis which run their course without laryngeal complications.

Laryngoscopic Appearances.

The examination of the larynx should be made with every care and gentleness; and in using the laryngoscope it should be remembered that in tubercular patients the fauces are very sensitive, and reflex movements are readily excited. The appearance presented by the parts will be found on examination to be quite as varied as the symptoms which have been enumerated. These various conditions will be considered as far as possible in the order of their occurrence, and the local lesions, according to the frequency with which they are encountered.

(1) **Anæmia.**—Pallor of the mucous membrane of the larynx occurs universally in the early stages of phthisis, and in many cases it may be observed long before the general health has become appreciably affected. This laryngeal anæmia is frequently in marked contrast to the state of the buccal and faucial mucous membrane, the colour of which may appear changed but little if at all. The occurrence of this profound local anæmia, out of all proportion to anything which may exist in the adjacent mucous surfaces, is always suspicious of early phthisis, and the symptomatic importance of this condition is increased by the occurrence of one-sided local hyperæmia; for instance, an area of injection localised to one vocal cord or to a portion of one cord. How far the lack of an efficient local blood-supply may, by lowering the vitality of the part, and weakening the resisting power of the laryngeal mucosa, predispose to, or favour the local development of, tubercle is an open question. That the condition occurs as a precursor of tubercular deposit is undoubted, and when it is present, the lungs

and sputum should be very carefully examined, the evening temperature should be taken for a period, and the patient's weight recorded.

(2) **Catarrh.**—Slight swelling, with general injection of the laryngeal mucous membrane may occur in one suffering from pulmonary phthisis, but it may be simple in nature (non-tubercular), and, under appropriate treatment, may entirely, though slowly, disappear. The occurrence of a simple catarrh of the larynx is not uncommon in those suffering from pulmonary tuberculosis, and may be due to the diminished power of resistance on the part of the larynx. When it does appear, the most marked feature is its chronicity; it is much more obstinate than a simple laryngeal catarrh occurring in a healthy individual, and in some cases it may be followed by tubercular deposit and ulceration.

(3) **Paresis**, or imperfect movement of the laryngeal muscles, resulting in incomplete closure of the glottis during attempted phonation, is met with in the early stages of laryngeal tuberculosis, and is usually bilateral. This may, in great measure, result from disturbances of innervation, associated with anæmia and catarrh, or from a diffuse myositis, or other change in the contractile substance of the intrinsic muscles of the larynx.

(4) **Paralysis** occurs but rarely in tubercular laryngitis, and when it is not the result of an intra-laryngeal infiltration, it is probably due to pressure exerted by some tubercular deposit, on the recurrent laryngeal nerve. It has been said, that when unilateral, the paralysis occurs on the same side as the pulmonary disease.

(5) **Changes in the Inter-arytenoid Membrane.**—It is in this locality in most cases that the earliest definite indication of tubercular disease of the larynx is to be observed. The earliest change noticeable is in the form of swelling and softening of the mucous membrane on the laryngeal aspect

of this fold. The affected surface becomes of a grey or ashy colour, resembling mucous membrane which has been softened by steeping in some fluid. This occurs long before there is any appreciable thickening of, or other evidence of infiltration in, the inter-arytenoid fold as a whole ; but it is none the less pathognomonic, and is due, I think, to the presence of tubercle bacilli, or early and infinitesimal deposits in the submucosa. It should not be looked upon, like anæmia, as a pre-tubercular stage, but as an actual tubercular lesion. I had long expressed my belief in discussion and in clinical demonstrations that this was the case, but was unable to have it corroborated by a post-mortem examination of the part in the early stage. However, the nature of this lesion was amply proved at a later period, and a few particulars of the first cases which were under my own observation may be of interest.

Two cases of phthisis were admitted to the wards of the late Professor Sir Wm. Gairdner to undergo treatment by the subcutaneous injection of Koch's tuberculin, on its introduction as a therapeutic agent in this country. Previous to the commencement of the treatment I was requested to examine and report on the condition of the larynx in each case. In one case there was general anæmia of the laryngeal mucous membrane without any localised lesion ; but the second case, a man aged 24, presented the condition under consideration—swelling and softening of the mucous membrane on the laryngeal surface of the inter-arytenoid fold—but to so slight an extent as to be unaccompanied by any symptom, such as huskiness or pain. In my report, dated 5th January, 1891, after describing the appearance of the parts, I remarked, that if the hoped-for reaction took place, *i.e.* if Koch's tuberculin was able to search out and excite inflammatory action in any part where tubercle was deposited, I would expect the inter-arytenoid fold to become inflamed and swollen. Treatment was begun by the injection of one

mm. of the fluid daily. This was gradually increased till the 17th, when seven mm. were administered, and shortly thereafter the patient experienced a "sharp pain on the left side of his throat, which interfered with respiration." This pain increased until 2nd February, by which date the dose had been increased to 22 mm., when I again examined him. The inter-arytenoid fold was then found to be highly inflamed, much swollen, and œdematous, although there was no ulceration of the surface detected, and his voice and respiration were both seriously implicated. "This swelling," to quote from Prof. Gairdner's report, "of the inter-arytenoid membrane was accompanied by so much soreness and difficulty of swallowing that it led to the discontinuance of the injections for a time at least."

Where the tubercular **infiltration** of the inter-arytenoid membrane is more marked than that described, the fold appears as a smooth rounded swelling, and its presence so interferes with the approximation of the vocal cords as to produce aphonia, or it may even, from its size, interfere with respiration. As the infiltration increases, the covering epithelium is raised from its limiting membrane, it becomes fissured, small portions become necrosed, and these portions, along with broken-down tuberculous material, are cast off and leave a raw surface.

Where **ulceration** of the inter-arytenoid membrane has occurred as a result of the breaking down of the deposits, it takes the form of a ragged deep ulcer, which is covered with muco-purulent secretion. From the surface of such an ulcer the granulations occasionally become exuberant, and form a sessile growth, pyramidal in shape, and which sometimes attains to a considerable size. It interferes with the

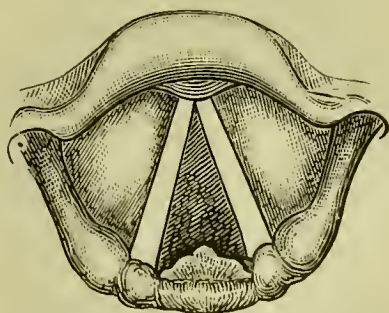


FIG. 69.—Mammilloid growth springing from the upper border of a tubercular ulcer of the inter-arytenoid membrane.

approximation of the cords, and obscures the ulcerated surface from which it springs. Perhaps one reason why the ulcer in this region tends to become deeper and its surface more prone to the formation of granulation tissue than is the case with tubercular ulcers elsewhere, is that this membrane is seldom at rest. During phonation, during respiration, and during deglutition, the inter-arytenoid fold is either on the stretch or is more or less contracted, rarely remaining for any length of time in one position.

Tubercular **infiltration** of one or both *ventricular bands* occurs perhaps next in frequency. The whole band becomes swollen, and from its increased size may obscure the vocal cord beneath, and occasionally it interferes with its movements. When both are affected, they may meet during phonation, and render the voice rough and husky.

Similar infiltrations may affect the *arytenoid prominences*, and if both are affected they appear as two large pyriform swellings lying in contact posteriorly, obliterating the inter-arytenoid space. The *ary-epiglottic folds* and the *vocal cords* may each be the seat of tubercular infiltration, though less frequently than the parts enumerated. In the former the infiltration is generally one-sided. Infiltration of the vocal cords is also, in the early stage, usually unilateral; the affected cord is thickened, and in place of being a flat white band, it becomes rounded and red, and the outline of its free border uneven.

Areas of infiltration may also be met with over the surface of the *epiglottis*, the parts most frequently affected being the free border and its edges, where these join the ary-epiglottic folds. Infiltrations here, as in other parts of the larynx, may, and most commonly do, occur in circumscribed patches, though occasionally the greater part, or the whole of the epiglottis may be involved so as to alter the form of this part of the larynx.

These infiltrations, wherever they occur, tend to break

down, and result in the *formation of ulcers*. The characteristic ulcer, as met with in the inter-arytenoid fold, has already been described. When ulcers occur elsewhere in the larynx, as the result of the breaking down of circumscribed tubercular deposits, they are, at first, small, grey, and somewhat crater-like, usually multiple, but, by the coalescence of neighbouring ulcers, they form after a time irregularly-shaped flat sores with undermined edges. Such ulcers may be surrounded by secondary deposits, and their presence is almost always complicated with œdema.

Œdema is met with most frequently in the loose tissue over the arytenoids, one or both of which may be affected; in the ary-epiglottic folds; and in the epiglottis (see Fig. 14, p. 45), though any part of the larynx may be so affected.

Diagnosis.—In the **diagnosis** of tubercular laryngitis there is occasionally room for doubt. In the early stages the diagnosis will rest largely on the condition of the lungs, the presence or absence of tubercle bacilli in the sputum, the course of the patient's temperature, and his weight-record. In typical cases the diagnosis may be easy, but where the local appearances are less definite, the condition is apt to be confused with a chronic laryngitis, with lesions due to syphilis, or it may be, in some instances, with malignant disease.

In **chronic catarrhal laryngitis**, the swelling is general, rather than localised, it is usually less marked than that caused by tubercular infiltration, and is accompanied by hyperæmia of the whole lining membrane of the larynx.

The difficulties in differentiation lie chiefly between syphilis and tubercle, and the chief local distinguishing features are as follows:

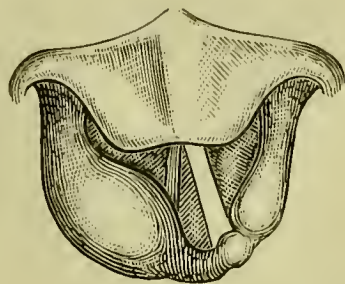


FIG. 70.—Œdema of the right arytenoid prominence in a case of early phthisis laryngea.

Tubercular Laryngitis.

Swellings from tubercular infiltration are usually pale.

Tubercular ulcers, of which there are usually several, are small in size, and comparatively superficial.

Tubercular ulcers may remain quiescent for a lengthened period, or spread but slowly.

Irritability of the fauces is almost always present, and frequently so great as to render a laryngoscopic examination impossible without the use of a local anæsthetic.

The lungs are affected in the majority of cases, and there are usually other signs of phthisis present.

Syphilitic Laryngitis.

Syphilitic deposits (gummata) are red and angry.

Syphilitic ulcers are usually single, irregularly circular in form, and frequently deep.

Syphilitic ulcers extend rapidly.

Tolerance of manipulation is a marked feature in most cases.

There is an absence of other symptoms suggestive of tubercular disease.

Scars in the fauces and pharynx, bearing evidence of former ulceration, suggestive of syphilis, and the presence or absence of tubercle bacilli in the secretion removed from the surface of the ulcer, will greatly aid in arriving at a definite diagnosis. The effect of the injection of tuberculin would clear up the diagnosis in a doubtful case, but the use of such means cannot be recommended. It must also be borne in mind that a phthisical patient may have contracted syphilis, and that the ulcers present in the palate, fauces, pharynx or larynx may be syphilitic in character, just as a patient who has had syphilis may, apart from that disease, develop phthisis.

Prognosis is at best doubtful, and in the majority of cases it is very unfavourable. When the lesion is, in the early stage say, confined to the inter-arytenoid membrane, and the lungs are apparently sound, healing, under appropriate

treatment, may take place, and by subsequent suitable climatic conditions something akin to a cure may follow. The same satisfactory result may be obtained when the ulcers are small, unaccompanied by œdema, when deglutition is not interfered with, and the general health is fairly good; but even if healing has taken place, relapses may occur at any time, or the patient may develop pulmonary phthisis of a more or less acute type. (Edema from tubercular infiltration, without ulceration, may remain *in statu quo* for a lengthened period; and if the pulmonary condition is good, or the lung disease is in an incipient condition, life may be prolonged for years. On the other hand, where ulceration has taken place, if the ulcers are numerous, or if, by coalescence, the ulcerated area is extensive, accompanied by copious secretion, and difficult and painful deglutition, the patient's strength will become rapidly exhausted, and death will occur within a very short time. As has already been observed, cases of laryngeal tuberculosis in which dysphagia is a marked symptom, prove much more rapidly fatal than pulmonary phthisis uncomplicated by laryngeal implication.

Treatment.—The treatment may be conveniently considered under Constitutional remedies, Local applications, and Surgical measures.

Constitutional Remedies.

As phthisis laryngea is only a part of a systemic disease, and is in most cases a complication of pulmonary tuberculosis, constitutional treatment is requisite, and it is in great part identical with the measures adopted in cases of pulmonary phthisis. These measures include:

(a) The **administration of medicines**, given with the object of counteracting the phthisical cachexia, increasing general nutrition, and relieving urgent symptoms. Chief amongst

the tonics are preparations of iron, quinine, arsenic, creosote and guaiacol, the hypophosphites of lime and soda, cod-liver oil, and preparations of malt.

Urgent symptoms must be relieved on general principles, as they arise.

(b) **Diet** is all-important, and where there is no interference with deglutition the patient should have a large choice of readily digested, nutritious food, plainly cooked, free from irritating condiments; and meals should be taken frequently, and with regularity. When deglutition is painful, or when, on account of loss of tissue, consequent on ulceration, food tends to enter the larynx while passing towards the gullet, it will be found that semi-solids, such as milk and soups, thickened with arrow-root, or isinglass, jellies and junket, are more readily swallowed than fluids, and these should not be sipped, but swallowed in quantity. Eggs, with meat and fish of various kinds in a finely divided state, should be included in the dietary.

Where there is dysphagia fluids may sometimes be taken with a fair measure of comfort by the patient lying prone on a couch and sucking the fluid through a tube. Again, if pain is so severe as to interfere with the taking of food in sufficient quantity, or when the patient prefers to do without food rather than suffer the agony associated with the act of deglutition, a local anæsthetic should be used to obviate the pain and to ensure the taking of a satisfying meal. To this end the larynx may be sprayed with a ten per cent. solution of cocaine, or a cocaine lozenge or pastille, containing from $\frac{1}{12}$ to $\frac{1}{6}$ of a grain, may be used immediately before food is taken. If the larynx be ulcerated an alcoholic solution of orthoform may be applied by means of a spray, or morphia ($\frac{1}{6}$ gr. of the acetate combined with starch or boracic powder) may be puffed over the raw surface, one hour before meal-time.

(c) **Hygienic Surroundings.**—The medical adviser should see that the patient's clothing is warm without being

weighty, and that he takes carefully-regulated exercise. In the less acute cases "open-air treatment" under suitable climatic conditions influences recovery favourably; but in the more acute cases the routine adoption of this form of treatment may be fraught with danger.

(*d*) The question of **climate** is fully discussed in articles on phthisis pulmonalis in many of the text-books on general medicine, so that here the subject need not be considered further than to draw attention to the essential features of the climate to be chosen, which are (1) "pure air," free from dust and organic particles; (2) abundance of sunshine without excessive heat, so that much time can be spent in the open air; (3) a temperature with few extremes; (4) absence of, or sheltered from, violent winds" (Sparks).

Local Applications.

(*a*) **Rest for the Larynx** should be insisted upon in all cases of tubercular laryngitis. The patient should be instructed to abstain from speaking as much as possible, and, when speech is absolutely necessary, whispering alone should be employed.

(*b*) **Sedative Inhalations**, such as hops, conium, and the like, in conjunction with steam, are sometimes useful, especially in the early stages when the frequent tickling cough is annoying; but they should be used with caution, as such moist inhalations tend to hasten the breaking down of tubercular deposits.

(*c*) **Dry Inhalations** of iodine, creosote, carbolic acid, chloroform, etc., applied by means of an oro-nasal respirator, form useful adjuncts to other treatment. In prescribing these it must be remembered that only a very small proportion of the antiseptic employed reaches the larynx or the bronchi, as the active volatile ingredient which is inhaled is to a large extent absorbed by the moisture on the surface of the

tongue, cheeks, fauces, and pharynx, and is swallowed or expectorated. But the wearing of the open-mesh respirator, while it interferes in no way with respiration, makes speaking less easy and so aids in resting the larynx. The air is warmed as it passes through the respirator, and it carries some of the vapour from the fluid on the sponge towards the larynx, where it acts both as a sedative and an antiseptic, with beneficial results in many cases.

(*d*) The **direct application** of various antiseptic and caustic agents is sometimes of advantage. Of these iodoform with boracic acid, iodol, glycerine of carbolic acid, creosote, lactic acid, formalin, orthoform, and menthol, have had their advocates. Lactic acid and formalin are favourite caustics, and orthoform and menthol are used on account of their sedative and antiseptic properties.

Lactic acid was introduced by Krause, who recommended that the interior of the larynx be swabbed with a 20 to 80 per cent. solution (though it is safer to begin its use with a five per cent. solution). The application is made by means of a brush or cotton swab, daily or at longer intervals, according to the effect. Though spoken of highly by many, I have found it frequently aggravate the local lesions in laryngeal phthisis, and so I advise against its use, except in chronic lesions.

Formalin was brought to the notice of the profession as a valuable application in the treatment of laryngeal tuberculosis by Solis Cohen. It should be used cautiously, beginning with a weak solution ($\frac{1}{2}$ per cent. of the pure drug) and slowly increasing the strength, if it can be tolerated, up to ten per cent. Like lactic acid, it is of most service in dealing with chronic lesions.

Orthoform is a sparingly soluble powder, with both antiseptic and anæsthetic properties, which was introduced by Lichtwitz and Sobrazes. It has the advantage of being non-toxic, and its anæsthetic effects may continue for many

hours if it be applied on a raw surface. It does not anaesthetise the unbroken mucosa. It is most conveniently applied in the form of a spirituous solution by means of a spray. The solution recommended by Yonge, and which is usually employed, consists of five grains of orthoform in one ounce of rectified spirits of wine and one ounce of water.

(c) **Inter-laryngeal Injections.**—The introduction into the larynx and trachea of volatile sedative antiseptics has proved beneficial in the treatment of laryngeal phthisis. In the development of this method I devoted much time in dispensary practice and in the wards of the Western Infirmary some years ago, where through the kindness of many of my colleagues I was enabled to employ it over a lengthened period in cases of tubercular disease of the larynx and lungs in almost every stage. Dr. John Burns was, as far as I am aware, the first to employ it in Glasgow, and the relief afforded in his first case was so marked that on his recommendation I adopted it and used it extensively. The solution which, after using a variety of combinations, I found most agreeable to the patient and most efficacious in tubercular laryngitis, is 12 to 15 per cent. menthol, with 2 to 4 per cent. guaiacol dissolved in olive oil or in paroleine. (Guaiacol, which is contained in beechwood creosote to the extent of 60 to 90 per cent., has all the properties of creosote, is devoid of its, to some, disagreeable odour, is a much more powerful germicide, and is of definite composition.) The solution is applied *not* by a swab over the ulcerated surface, but by means of a syringe, the solution being injected *through* the larynx into the trachea and bronchi. The syringe may vary in capacity, holding from 25 to 40 minims, and the vulcanite laryngeal tube attached should be of equal calibre throughout, and should terminate in a single aperture only. In the administration of the injection I invariably employ the laryngeal mirror, by the aid of which the point of the laryngeal tube of

the syringe can be accurately guided over the epiglottis and into the larynx without coming into contact with the tongue, the fauces, or the pharynx, thus obviating all risk of exciting retching. After a little practice, the tube in the majority of cases can be readily inserted, and the injection given without the aid of the mirror, by placing the patient before a good light, having his tongue held in the protruded position with the mouth wide open. The ease

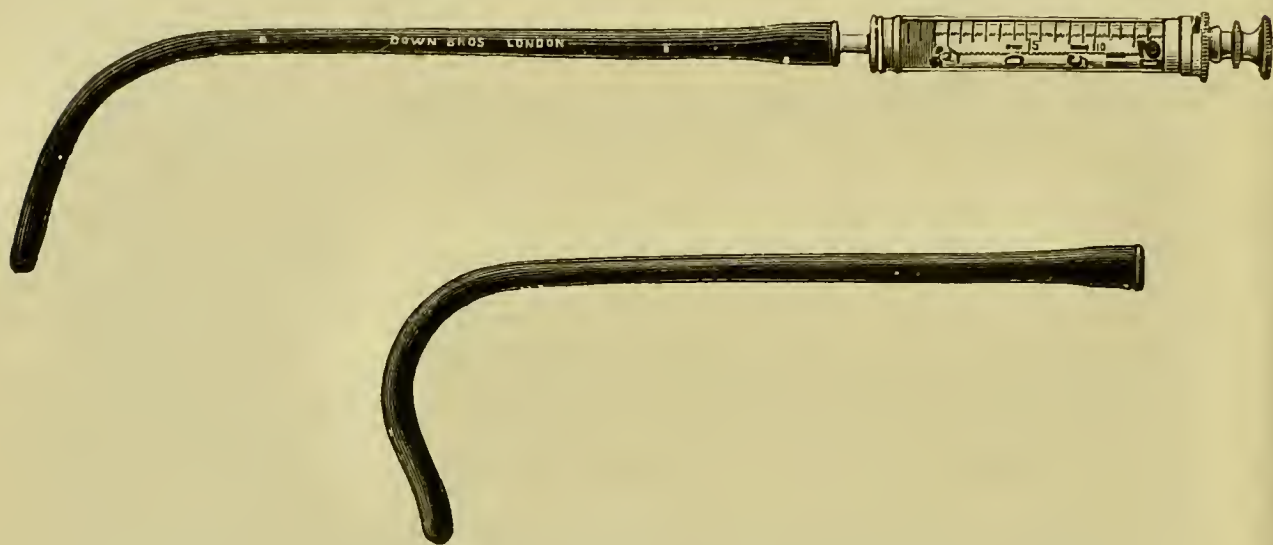


FIG. 71.—Syringe and Author's tubes for the intra-laryngeal injection of solutions of menthol, etc.

with which the tube can be introduced within the larynx depends greatly on the shape and position of the epiglottis. Where it is elongated and pendent it will be found necessary to resort to the use of the frontal and laryngeal mirrors, with, it may be, a specially curved tube, the point of which, in place of being at right angles to the stem, is bent to a more acute angle, as represented by the spare tube in Fig. 71. The point of the laryngeal tube should be inserted *within* the larynx to the level of the vocal cords at least, and it should be in that position before the fluid is injected. If this is not attended to, and the fluid is spread over the cords, the sensation resulting is disagreeable, and similar to that experienced when something is said to have “gone the wrong way,” and coughing may be excited. If, however,

the nozzle of the syringe be placed at or below the level of the cords, the fluid is injected directly through the larynx into the trachea, and as much as two drachms in most cases can in this way be injected without the slightest inconvenience to the patient. Using a syringe of 25 or 30 minims capacity, the injection may be repeated three or four times at each sitting, thus giving roughly from a drachm and a half to two drachms; and by applying it in this gradual way, coughing is rarely induced, as it sometimes is when a larger quantity is injected at one time.

Menthol is (1) a local anæsthetic, (2) a powerful stimulant, and (3) a highly volatile antiseptic. By its use as described the full effect of these qualities is obtained. On account of its anæsthetic properties relief from cough follows its introduction, and this is attained in a way greatly to be preferred to the use of morphia locally, or to the older fashion of administration of opiates by the stomach, with their consequent deleterious effects on alimentation. Its stimulating qualities need not be referred to, further than to mention their efficacy when the lungs are seriously involved; but its antiseptic properties, which are rendered more serviceable on account of its volatility, and more powerful by the addition of guaiacol, are of the first importance. The oily solution having been introduced into the trachea and bronchi, the active ingredients slowly volatilise and are borne over the affected laryngeal surface with each expiration, thus surrounding it with an antiseptic atmosphere, the odour of which can readily be detected in the breath, six, eight, or ten hours after the injection has been given. The oil is, I suppose, partly absorbed, but the bulk of it is driven upwards through the bronchi and trachea, along with the mucous secretion, by the cilia of the epithelium, towards the larynx, from which it enters the gullet. Though healing frequently occurs under its influence, menthol cannot be considered to be a specific in the cure of

tubercular lesions. In many cases the ulcerative process continues to extend while it is being employed, but even in these instances the patient almost invariably obtains some measure of comfort from its use. The relief obtained from the irritating cough, with the consequent rest to the larynx, is perhaps the most marked result, and that for which the patient is most grateful. Personally, I have obtained favourable results from its use as here described, in a very much larger proportion of cases than from any other form of treatment; but though I have frequently attempted to classify the cases in which improvement might be expected, I have found it impossible to lay down any hard and fast lines. In some apparently favourable apyretic cases ulceration has steadily progressed, while in other cases, with extensive ulceration associated with rapid wasting, high fever, etc., healing has occurred. As an example of healing of extensive tubercular ulceration of the larynx, the following, which is one of several cases which have been published by me in *Glasgow Medical Journal* and *British Medical Journal*, may be given:

Peter M'L., aged 33, was admitted to the Western Infirmary on 29th November, 1889, complaining of hoarseness, with pain and difficulty in swallowing, of nearly three months' duration, but much aggravated of late. On laryngoscopic examination it was found that both ary-epiglottic folds and the epiglottis were deeply injected, the ventricular bands were inflamed and thickened, and the inner edge of each eroded. The vocal cords were deeply injected, and the free edge of each was ulcerated throughout the greater part of its length. The vocal cords moved with difficulty on account of the degree of inflammatory swelling. In the examination of his chest, percussion appeared to be equal over both lungs, but the respiratory murmur was feeble all over the right side in front, with occasional clicking râles under the right clavicle; and the sputum contained an abundance of

tubercle bacilli. Three days after admission he weighed 10 st. 12 lbs., and his weight steadily increased from that date till 14th February, when previous to being dismissed he registered 12 st. $4\frac{3}{4}$ lbs., a gain of 1 st. $6\frac{3}{4}$ lbs. in eleven weeks.

Previous to admission to hospital he was losing flesh rapidly, had profuse night sweats, and sleep was much broken by the constant tickling cough, and by the dry and painful feeling in the larynx. After the first few days of the menthol injection this was altogether changed; he slept undisturbed the whole night long, and in reply to a query on this point, he replied that "if he continued to progress as he had done he would shortly become a second Rip Van Winkle." The laryngeal ulceration entirely healed, as was witnessed by several medical *confrères*, and his voice was restored to its normal degree of clearness. While in the Infirmary he was under the care of the late Professor Joseph Coats, who had examined the larynx several times; and, in reply to a request for an expression of opinion on the case, he wrote, "I regarded it as a distinct case of tubercular ulceration of the larynx. He improved in his general condition while in the ward, and the local lesion virtually healed." The condition of his chest was also distinctly improved. He returned to work, which he attended to more or less regularly for two years. At the end of that time he again came to the Infirmary complaining of cough and pains over the chest. His voice had remained good, and there was no evidence of mischief within his larynx. There was, however, tubercular deposit in both lungs, for the treatment of which he was again admitted to one of the medical wards.

Surgical Measures.

(a) **Excision of diseased parts.**—It has been suggested, and the suggestion has been carried into practice by some,

that tubercular deposits and ulcers in the larynx should be treated in the same way as tubercular glands and tubercular ulcers of the skin, namely, by scraping away or otherwise destroying the diseased tissue. This may be done by means of cutting forceps, curettes, or by the galvano-cautery. A healthy surface may in this way be reached and the resulting sore may heal satisfactorily. Where, however, the surface

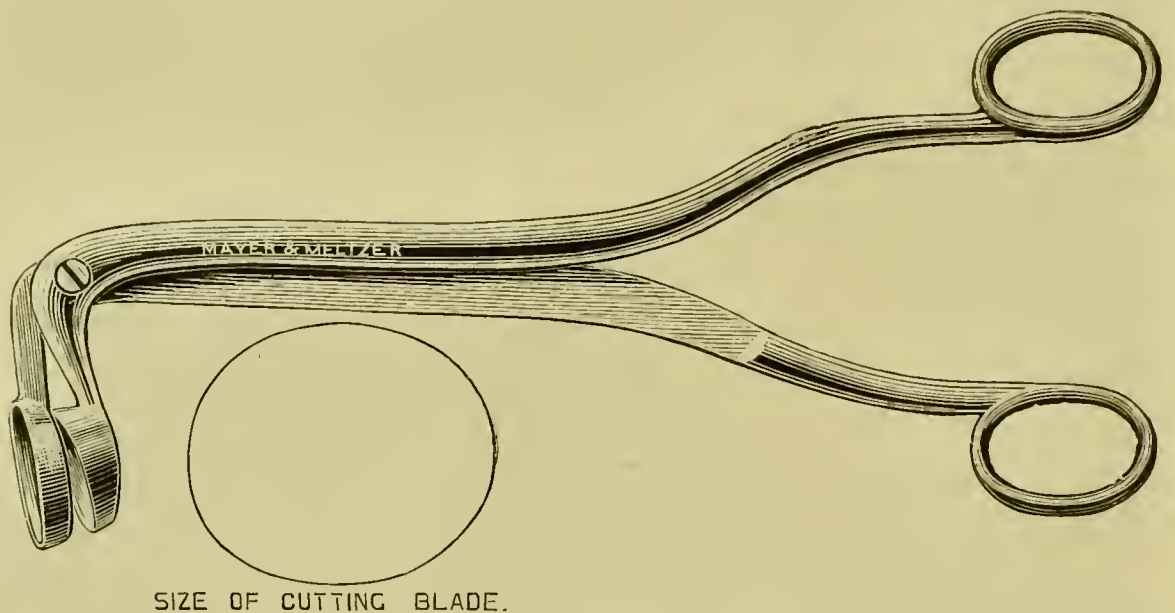


FIG. 72 —Barwell's modification of Lake's punch forceps for removing portions of the epiglottis.

to be operated upon is extensive, the operation is apt to be followed by considerable swelling, so that a preliminary tracheotomy is sometimes a wise precautionary measure. But this may seriously complicate the operation, for, as will be shown, tracheotomy in those cases imperils the safety of the lungs.

Where the epiglottis is ulcerated, the ulcers may be scraped with a curette or the diseased part may be removed with ring-forceps; and where it is extensively destroyed, the epiglottis may be entirely removed by means of the galvano-cautery snare, the use of which removes all risk of hæmorrhage.

Smaller cutting forceps, suitably curved, are used for the removal of disease in other parts of the larynx, and

inter-arytenoid granulomata may be removed with punch-forceps, or by the flat burner of the electric cautery.

(b) **Scarification.**—When œdema is present, and so situated or so extensive as to cause dyspnœa, warm inhalation should be employed to begin with. Should it not be relieved thereby, then the more translucent parts should be freely incised, the result of which is often most satisfactory.

Where these measures fail to relieve the respiratory difficulty resort must be had to intubation or tracheotomy.

(c) **Intubation.**—Theoretically, intubation is the better method of attaining the desired result, but it is disappointing in practice. On account of the very sensitive condition of the parts, the tube, while it remains within the larynx, is a source of constant irritation, and induces coughing and retching which, in many instances, are only relieved by its expulsion. In those cases where it can be tolerated, it is apt to lead to erosion of the laryngeal mucosa.

(d) **Tracheotomy**, in tubercular disease, should only be employed where dyspnœa is urgent. The cause of the urgent symptom which calls for operation may be œdema, granulomata, or the displacement or the impaction of a piece of necrosed cartilage; but in no case can the operation be considered as a curative measure. It is palliative only; performed to avert death from suffocation. The wearing of the tube frequently causes considerable irritation in the wind-pipe, and in most cases, not only does the wound become infected, but the insertion of the tube is followed by a rapid increase in the severity of the pulmonary symptoms. The air taken into the lungs through the tube is not warmed, moistened, and freed from impurities, as it is when inhaled through the nose or mouth. Nevertheless where dyspnœa is severe, the operation should be performed.

III. LUPUS OF THE PALATE, FAUCES, PHARYNX, AND LARYNX.

Lupus, by which is meant a diseased state similar to that affecting the skin, and described as *lupus vulgaris*, may attack the palate, fauces, pharynx, and larynx. It is somewhat rare to find it as a primary lesion in those parts. Where they are affected, the disease is usually in those who have, or bear evidence of having had, lupus of the nose or face. Dr. Radcliffe Crocker reports a case where the disease began in the gum of a strumous child, aged two years, with no lupus elsewhere, and Mr. Lennox Browne gives particulars of another primary case—"the exception which proves the rule." The patient, who was under the observation of Dr. Orwin, was 21 years old. She had had lupus of the throat, which resulted in considerable destruction of tissue of gums, pharynx, and larynx, for six years, and it was only after the lapse of that time that her nose became affected with *lupus vulgaris*, the appearance of which served to confirm the diagnosis.

Of recent years I have seen more than one case of lupus of the palate and of the larynx, where no evidence of the disease could be discovered on the face or elsewhere.

Lupus is often associated with the scrofulous habit, and in many cases there is a family history of phthisis ; and yet it is the exception to find other evidences of tubercle in patients with lupus. It is more common in females than in males, and it is most frequently met with in early adult life. The lesion may be mistaken for true tubercular ulceration, or for tertiary syphilis, but perhaps syphilitic ulceration of the palate, fauces, pharynx, and larynx, is more often diagnosed as lupus.

When lupus occurs in the upper respiratory tract it may be as an extension of the disease from the face, which has implicated the lips, the gums, and the palate, in its progress ;



Lupus of the palate and uvula in a girl 16 years of age.

or it may appear on the palate, pharynx, or larynx, without any such direct invasion.

It is a distinctly chronic condition, and is remarkably devoid of pain. In some cases there may be extensive ulceration present, or there may be evidence of former widespread ulceration, without the patient having made any complaint of pain, or even of discomfort.

Pathology.—The true nature of this disease has been the subject of debate amongst pathologists and dermatologists. Some, following Koch, who demonstrated the presence of bacilli apparently identical with the bacillus of tubercle, consider lupus to be a chronic tubercular affection, and it was styled by Martz “attenuated tuberculosis”; while other eminent observers have opposed such a theory. The presence of the bacilli is by no means constant; it is thought by some to be accidental, and when they are found, they exist in very small numbers. Lupus lesions react to the injection of tuberculin, and the injection of lupoid tissue into guinea-pigs has produced tuberculosis in them. On the other hand, the chronicity of the disease is so different from the course pursued by tubercular affections of those parts, that the larynx may be extensively affected by lupus, and over a long series of years, while the lungs remain wholly unaffected.

Appearances presented by Lupus.—There are three stages of the disease observable in the throat: (*a*) infiltration or deposit, (*b*) ulceration, and (*c*) cicatrices.

In the first stage there is an infiltration of the mucosa with small cells, amongst which a few “giant” and “plasma” cells may be found. These areas of infiltration give the surface a granular character, and as the individual nodules increase in size they assume the “apple-jelly” colour and appearance met with in lupus in other parts.

The tendency of the nodules is to soften, a process which is slow and painless, and the resulting ulcers are for the

most part small, irregular in shape, and superficial. The surrounding surface is injected, and rough and irregular from the presence of rounded deposits. These ulcers while they heal at one part, spread at another, and in the healed surfaces cicatricial tissues develop, which may cause considerable deformity, and, it may be, distortion of the parts. Recurrence of ulcers in the scar tissue is almost pathognomic of lupus.

In the Palate.—The disease may affect any part of the palate, the neighbourhood of the raphe of the soft palate being a favourite site for its appearance. From this centre it readily spreads to the uvula, and when the latter structure is involved it becomes swollen, hard and nodular. Later small ulcers appear, and as the ulcerative process extends, it may lead to the partial or complete destruction of the uvula.

In the Pharynx.—The disease may appear on the posterior wall with or without the neighbouring parts being involved. After the ulcers have healed, the mucosa may be replaced in great part by scar tissue, causing the buccal pharynx to appear unnaturally white.

In the Larynx.—When the larynx is affected, the epiglottis and the ary-epiglottic folds are usually the first parts to be involved. There is considerable infiltration and tumefaction, and the epiglottis is frequently enlarged irregularly. While the cartilages are but rarely attacked, yet a considerable portion of the epiglottis may occasionally be destroyed; and sometimes ulceration is followed by the appearance of granulation-tissue out-growths. Subsequent cicatrization may lead to deformity of the larynx and occasionally it may culminate in stenosis.

Symptoms.—Where the palate and pharynx alone are affected, there may be no symptoms save slight discomfort in swallowing, due to stiffness of the palate from infiltration.

When the larynx has been invaded there may be difficulty in deglutition, especially if there is much swelling of the

epiglottis, and there may be hoarseness where the arytenoids, the ventricular bands, or the vocal cords are involved.

Prognosis.—The disease runs a very slow course, in few cases is there any immediate danger to life, and its cure may be looked for in a fair proportion of cases. In many cases the destructive process is superficial, and, in a considerable proportion of these the disease becomes arrested spontaneously after a time, while others respond satisfactorily to treatment. In some rare instances tracheotomy may be necessary to ward off the dangers consequent on stenosis of the larynx.

Pulmonary tuberculosis occurring as a result of lupus of the larynx is sometimes spoken of as an ever-present danger. With an experience of a considerable number of cases of lupus of the larynx, which have been under observation over a series of years, and in some of which the larynx was extensively involved, I have come to the conclusion that the risk of pulmonary phthisis from this source is infinitesimal.

Diagnosis.—In the diagnosis, care is necessary to differentiate between lupus on the one hand, and syphilitic and tubercular lesions on the other. The leading distinguishing points are that lupus begins in early adult life, and usually affects the mucous membranes secondarily to the skin, is of a very chronic character, the ulcerative process spreads very slowly, and is associated with anæmia of the mucous membrane. The surface around the ulcer is roughened or finely nodular, and, while limited areas of cartilage may be destroyed, lupus never leads to necrosis of the bones. Unlike a true tubercular lesion, lupus is usually unaccompanied by pain, its presence does not cause emaciation, and healing may be observed at one part while it continues to spread at others.

In differentiating between lupus and syphilis there is often considerable difficulty. When doubt does exist after a careful examination of the parts, and a careful search for lesions due to inherited syphilis, a course of anti-syphilitic

remedies should be prescribed before operative measures are resorted to.

In some instances the question of malignancy may call for consideration and exclusion.

Treatment.—In recommending treatment, the condition of the general health must be considered, the patient should be placed amidst healthy surroundings, and the diet and digestion attended to.

Medicinally, cod-liver oil, iodine, the hypophosphites and arsenic are, perhaps, the most generally useful in modifying the strumous diathesis, and influencing the cure of the disease. Arsenic appears to have almost a specific action in some cases. It should be given in doses of two minims to begin with, three times a day after food, and the dose should be slowly increased until ten minims are given three times a day. Should any gastric disturbance result it must be discontinued for a few days, then recommenced in small doses. Thyroid extract has been recommended in the treatment of lupus lesions which cannot be dealt with directly, and the injections of tuberculin, guided by observation of the opsonic index, may be used. Tuberculin injected subcutaneously should be given with great caution in cases where the larynx is affected.

Locally, the diseased parts should be destroyed. This may be accomplished by the use of chemical caustics, the galvano-cautery, or by the scraping away of all lupus tissue with a sharp curette, as is practised when the skin is affected; and where the uvula is involved it may be clipped away with scissors. The bleeding which follows curetting may be checked by pressure, and when it has been stopped, the raw surface should be treated with some strong chemical caustic, such as tri-chloroacetic, chromic, lactic or salicylic acid. As evidence of the thoroughness of the measures necessary, Hutchinson remarks in one of his post-graduate lectures that "in all cases of lupus the treatment was based upon

faith, that was to say, the practitioner had only to make up his mind that plentiful cauterisation would cure the disease and the disease would be cured."

When the disease is situated within the larynx, it is occasionally possible to excise the affected area, and this is particularly the case where the disease is limited to the epiglottis. This result may be attained by the use of biting-forceps such as Lake's. (Fig. 72, p. 310.)

Granulation-tissue excrescences on the ventricular bands, and on the inter-arytenoid membrane, may also be partially or wholly removed with similar forceps, or with the electric cautery. These operations can be carried out very satisfactorily under local anæsthesia.

Where narrowing of the larynx occurs, either as the result of extensive infiltration or from cicatricial contractions, much may be done to add to the patient's comfort, as well as to minimise the risk of death from asphyxia, by intubation. The wearing of a tube may by pressure favour the absorption of the inflammatory infiltration, and may ultimately overcome the stenosis. On this and on other grounds, intubation is to be preferred to tracheotomy in cases of respiratory difficulty associated with the lesions of lupus within the larynx, or in the sub-glottic region.

CHAPTER XVI.

DIPHTHERIA.

DIPHTHERIA is an acute infective disease, which, although endemic in some localities, particularly in the more densely populated districts of large cities, occurs usually in epidemic form.

The **antiquity** of this disease is indicated by various records, and in the present day its prevalence is so general that in almost every country of the world it occupies a prominent place in the mortality lists. In this country, according to the returns of the Registrar-General, there was a progressive increase in the rate of mortality from diphtheria during the twenty years prior to the introduction of diphtheria-antitoxin.

Causes.—The **exciting cause** of Diphtheria is the Klebs-Loeffler bacillus, which acting locally at the site of inoculation, usually in the fauces or other part of the upper respiratory tract, leads to a membranous inflammation of the surface affected. On this surface soluble toxins are formed by the bacilli, and these on being absorbed lead to serious systemic changes.

The disease is characterised by general prostration, a rapid pulse, moderate elevation of temperature, and the presence of a pseudo-membrane.

Predisposing Causes.—There are many conditions which may be classed as predisposing causes worthy of attention.

Age.—While diphtheria may attack persons of any age, 95 per cent. of the fatal cases in England, according to Dr. Thursfield's statistics, occur under ten years of age, the largest proportion of these being between the ages of one and five years. From five to fifteen years the mortality is less, and it decreases as the ages of the patients increase.

Cold and Damp.—Diphtheria is found in almost every country of the world, occurring thus under widely varying conditions of climate and temperature; yet in studying its geographical distribution and its appearance with reference to the seasons, it will be found that its development and spread are favoured by cold and damp.

The bacillus diphtheriæ has been found to retain its vitality best under conditions associated with dampness. Therefore, anything which leads to dampness of a habitation, be it a cold season, inclement weather, or a subsoil favouring stagnation of water in the immediate neighbourhood, and inefficient or neglected drainage, predisposes to the occurrence of diphtheria.

Season.—The disease is most prevalent in late autumn; the largest number of cases occur during the months of October and November.

Condition of the Mucous Membrane.—Healthy mucous membrane is able to resist injury to a varying extent in different individuals, and this power appears to increase, or in other words, the mucous membrane becomes less susceptible to irritation, as age advances. This power of resistance is diminished by the presence of any inflammatory condition, catarrhal, or otherwise, and by erosion and ulceration of the mucous membrane. These facts may, in part, explain why children are so frequently the subjects of diphtheria, and why cold and damp, which tend to excite catarrhal affections of the upper air passages, may act as predisposing causes. Similarly a child with chronic enlargement of the tonsils, which are often affected by atmospheric changes, is more

liable to contract diphtheria during an epidemic, than one whose throat is in a normal state.

Idiosyncrasy.—Diphtheria cannot, perhaps, be considered a hereditary disease in the ordinary meaning of the phrase. Yet numerous well-authenticated instances have been recorded where several, and, in some cases, all the members of certain families have fallen ready victims to this disease, being attacked during different epidemics and in different localities. In such instances there would appear to be some similarity of constitution predisposing to the reception and development of the specific contagium.

MODES OF INFECTION.

Direct Contact.—The specific poison of diphtheria may be conveyed in a variety of ways, of which direct contact by deposition of the diphtheritic exudation on a mucous surface, or on a wound, is one. This may occur during the examination of the fauces of a patient suffering from diphtheria or during the application of some local medicament, when the patient, while the mouth is widely opened, expels small portions of the false membrane during the act of coughing, which may alight on the lips or enter the mouth or nose of the nurse or doctor. Clearing an obstructed tracheal cannula by suction with the lips has been the means of conveying the disease to more than one surgeon, and the nipple of a mother may become affected by suckling a child suffering from diphtheria.

Fomites.—The contagion may, on the other hand, be carried by air-currents, it may be retained on the walls, wall-paper, furniture, etc., of a room which has been occupied by a patient suffering from diphtheria, or by any of the many porous materials which surround him, and it may be carried by the clothing of those who have been exposed to the infection.

Milk.—The disease may be conveyed by articles of food

and drink ; milk especially forms a ready vehicle. Cows are liable to a vesicular and pustular eruption of the udder and teats, from which the bacillus of diphtheria has been obtained. The infective material may be conveyed by the hands of the milkers to the milk, and the result may be a widespread epidemic of diphtheria.

Domestic Pets.—Cats may contract diphtheria from man ; the disease may spread from one cat to another, and in turn the cat may transmit the disease to the human subject, and may be the means of infecting many.

Pigeons and chickens have in some cases been suspected of being the means whereby the disease was conveyed to the human subject.

Water Pollution.—In towns, contamination of the air in dwellings by defective plumber-work, and in the country, pollution of the water supply by sewage, are frequently demonstrated as the means by which the poison has been conveyed to the individual.

School Attendance.—The influences of school attendance on the spread of diphtheria is of great importance. A child with a very mild attack may make no complaint and thus continue attendance at school, and some who are not themselves affected by diphtheria may be the means of carrying the bacillus by which others are infected. As in school, numbers of children are in close association for several hours daily, and at the age most susceptible to diphtheria, the disease once introduced readily spreads.

As bearing on this point, the following statement by Dr. Thursfield is interesting, that “in his experience a larger proportion of cases of diphtheria go unnotified than in connection with any other disease” ; and that in 1893, in four well-marked epidemics of diphtheria occurring in widely separated parts of the country, he found, on investigation, that there had been at least 135 cases, of which only 21 (15 per cent.) had been notified as diphtheria, and that the

spread of the disease was distinctly traceable to personal infection through school-agency.

PERIOD OF INCUBATION.

There is considerable uncertainty concerning the **period of incubation** in diphtheria. Mackenzie relates two instances illustrating the marked difference in the time which may elapse between exposure to the contagion and the appearance of the disease. In one case a girl, 6 years of age, was found to be suffering from diphtheria, with abundance of false membrane, on the morning following the afternoon on which she was first exposed to the infection: and in the other, a lady of 18, the disease did not appear until fifteen days after exposure to contagion. However, the actual time which elapses between exposure to the action of the bacillus, and the appearance of the disease, is considered to be **from two to five days**, and when the period is longer, the germs in all probability have been lodged in the clothing, and have not gained entrance to the system till some time after exposure.

PATHOLOGY.

Diphtheria is a poison-disease. The bacilli are implanted on a mucous surface, where they lead to the production of a toxin, which is readily absorbed, and, entering the lymphatic vessels, passes on to the lymphatic glands, and thence into the general circulation. The toxin, according to Ehrlich, consists of two poisonous substances, one of which causes the acute symptoms and death, while the other produces paralysis in those who survive. Following the implantation of the bacillus, necrotic changes occur at the seat of inoculation, and there is also a sharp inflammatory reaction, which results in the formation of a fibrinous exudation. The false membrane, which is a tough elastic substance, usually yellowish or greyish-white in colour, though

occasionally of a brownish tinge, consists, as seen under the microscope, of a network of fibrinous threads, in the meshes of which are found epithelial cells, leucocytes, necrosed tissue, red blood corpuscles, pus cells, and numerous micrococci. On the surface of the membrane the various microorganisms associated with putrefaction are found, while in the deep layers the Klebs-Loeffler bacillus exists in a state of almost absolute purity. Secondary systemic poisoning may occur where the sloughing membrane becomes gangrenous and the resulting putrid matter is absorbed.

Fatty degeneration of the heart may occur as a result of the direct action of the toxin, and death from heart failure may occur from this cause in very acute cases. Degenerative changes may also occur in the kidneys, the liver, and in the central nervous system.

SYMPTOMS.

The symptoms of diphtheria, which vary from those of a slight sore throat to those of severe and even malignant blood-poisoning, are determined by the intensity of the systemic disturbance and of the local inflammation, the position and extent of the membranous exudation, and the presence or absence of complications.

After exposure to the specific poison, the period of incubation, varying probably from two to five days, follows, and during this time there may be absolutely no symptoms, though usually languor and chilliness are complained of. The completion of the term of incubation is indicated by an elevation of the temperature of the body, rising within a few hours to any point between 99° to 102° F.; by an increased pulse-rate, by a feeling of dryness in the throat, with uneasiness or slight pain on deglutition, and sometimes earache; by stiffness of the neck, chilliness, and disinclination for exertion. When the patient is an adult, complaint is made of headache, and of pains in the dorsal and lumbar regions.

There are two sets of symptoms (*a*) those dependent on the condition of the throat, and (*b*) symptoms due to toxæmia.

The presence of membranous exudation in the throat is the characteristic symptom, as it is an almost invariable phenomenon of diphtheria; but occasionally mild cases occur in which it is absent, and in other very rare instances the patient dies before it is developed.

CLASSIFICATION.

According to the position of the exudation, diphtheria is classified as **faucial**, **pharyngeal**, **nasal**, or **laryngeal**; and it is termed "primary" or "secondary," according as it occurs as an idiopathic condition, or supervenes, as it occasionally does, upon some other disease, such as scarlet fever.

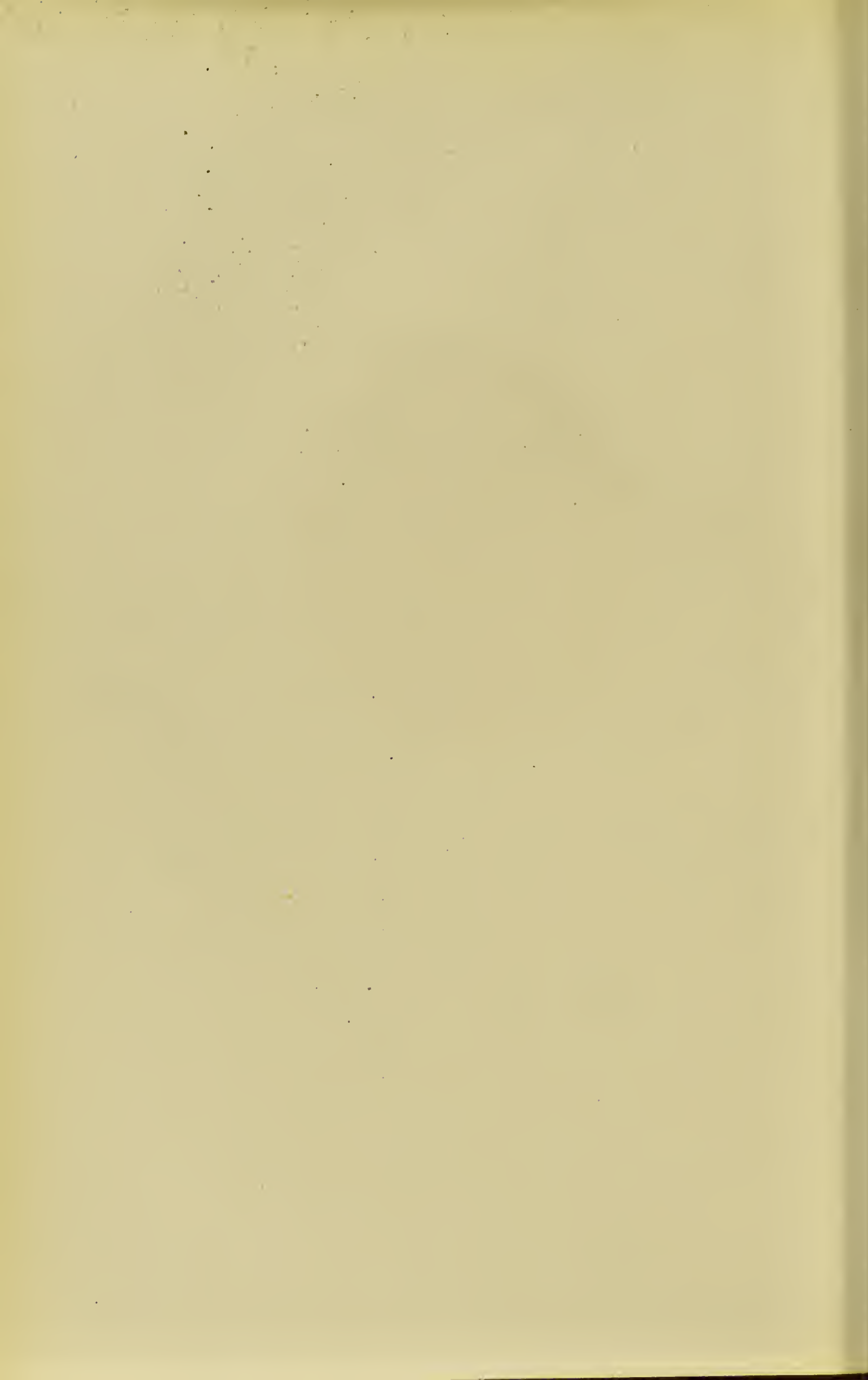
Classified according to its severity, the attack is described as **mild**, **well-marked**, **severe**, or **malignant**.

FAUCIAL AND PHARYNGEAL DIPHTHERIA.

On **examination**, the fauces, tonsils, and pharynx may be inflamed, but the redness and tumefaction may differ in no way from that of an ordinary catarrhal faucitis. If, however, the appearance of the parts is carefully noted as the disease progresses, one or more whitish spots, somewhat resembling small collections of muco-pus, are seen to make their appearance where the mucous membrane is most deeply injected. They are never numerous, and very often there is only one spot. Each tends to increase in size—neighbouring spots, where there are several, coalesce—and as the extent and thickness of the patch increases, it becomes opaque, clearly defined, firm, and tough. Such patches are most frequently found on the surface of one or both tonsils, from which they tend to spread to the pillars of the fauces and the palate, and towards the pharynx. The appearance of this fibrinous exudation is usually followed by a **lowering** of the temperature, and the lym-



Diphtheria in a girl 12 years of age. The pseudo-membrane here covers the greater part of the right tonsil, which is inflamed, and is seen to be extending over the posterior pillar.



phatic glands at the angles of the jaw at the same time become swollen and tender. Occasionally, advice is sought at this stage on account of the glandular swellings, the discomfort in the throat being so slight in some cases as to raise no suspicion of disease within the mouth.

In some cases patches of membrane appear at the margin of the openings of the crypts of the tonsils, and the result is a condition identical in appearance to that presented in acute follicular tonsillitis. This form is said to be associated chiefly where the contagion has been conveyed by milk. These patches may remain isolated, but they usually spread and coalesce, and may ultimately form one large patch which may cover the whole tonsil.

In the *malignant* form the fauces and pharynx may be thickly covered with membrane, dark in colour, putrid and foul-smelling, and hæmorrhage from the surfaces may occur.

When, as occasionally occurs, the inflammation of the affected mucous membrane is severe, and the submucous tissues deeply involved, the temperature may rise above that recorded before the appearance of exudation. When this is the case, it is accompanied by a proportionate rise in the pulse-rate, or the usual ratio may be exceeded, and the pulse resemble that of shock—small, rapid, and irregular. As the inflammatory process subsides, the temperature falls and the pulse improves.

Where the case is of the *benign* type, the temperature rarely exceeds 102° F., and it often does not approach that point; the glandular involvement is usually slight, and the exudation is limited to the surface of the enlarged and inflamed tonsils; or should it spread beyond their limits, it does so to a slight extent only, and usually towards the uvula and palate.

While the membrane is present, portions of it may be detached by coughing or during the act of deglutition. At

a period varying from the third to the eighth day of the disease, in mild cases, and in well-marked cases running a favourable course, the false membrane exfoliates and the underlying mucous membrane rapidly recovers its normal appearance, that which has been destroyed is replaced, and the swelling of the tonsils subsides.

In place, however, of the gradual subsidence of the symptoms described, or after an apparent cessation of the more acute symptoms, and while the exudation is becoming loosened and detached, the inflammation may again become acute and affect the parts involved more deeply than before, producing greater local irritation and more severe constitutional disturbance. This is usually due to a mixed injection. A fresh impetus is given to the growth of the pseudo-membrane, which rapidly spreads over the fauces to the palate, and from the fauces it may spread to the pharynx, and from this upwards to the nose, or downwards towards the larynx; or it may extend in both directions.

The false membrane in the throat becomes grey in colour and the tissues around less inflamed, and in some cases pale and œdematous, and the breath has a fetid odour. The progress of the case is towards asthenia; there is marked depression, the temperature becomes subnormal, and the pulse is weak, irregular, and intermittent. Appetite fails, and occasionally the compulsory ingestion of food is followed by sickness and vomiting. The urine, the examination of which should never be omitted, is scanty and high coloured, and will usually be found at this stage to be loaded with albumen. The child deeply poisoned with the toxins may succumb within a few days, or it may linger for a time and die of paralysis or toxæmia.

When recovery takes place in such a case, it is usually by slow degrees, and the membrane may remain present in the fauces for from ten to fourteen days, by the end of which time it has usually been discharged.

NASAL DIPHTHERIA.

When diphtheritic exudation forms within the nasal cavity, it usually, though not always, occurs as an extension from, and is thus secondary to its appearance in, the fauces and pharynx. This condition is recognised mainly by the character of the discharge from the nostrils, which is profuse, muco-purulent in character, and highly irritating. It rapidly causes excoriation of the margins of the nostrils and the upper lip, and on the raw surface so produced, diphtheritic membrane frequently forms. The nares become more or less completely obstructed, there is occasional epistaxis, the result of inflammatory congestion or superficial ulceration of the lining membrane of the nose, and the breath is fetid.

Nasal diphtheria is always a serious complication, as from the readiness with which absorption takes place through the nasal mucosa, constitutional poisoning is rapid and severe.

If death occurs in a case where the exudation has been confined to the fauces, pharynx, and nares, it does so in the majority of cases as the result of toxæmia. No interference with respiration of any special importance may have occurred, but progressive weakening of the heart's action is manifested. Death from this cause may be gradual, or it may occur suddenly and unexpectedly during, it may be, some slight excitement or exertion, as in attempting to sit up in bed.

LARYNGEAL DIPHTHERIA.

When diphtheritic membrane forms **within the larynx** a totally different set of symptoms result. This laryngeal diphtheria constitutes **true croup**.

Exudation may appear primarily in the larynx, but in most cases it occurs as an extension of the disease downwards from the pharynx, and when this is the case, the

implication of the larynx almost always occurs within the first week of the disease.

The **symptoms** associated with invasion of the larynx are, in the first place, those of **laryngeal irritation**, the most marked being a harsh, high-pitched, metallic, dry cough, which comes on in paroxysms. This is followed by changes in the **voice**, which becomes rough and husky, and in some cases it may go on to aphonia. Difficulty in **respiration** is next observed, and this, which at first may be variable, due largely to laryngeal spasm, increases in degree, and becomes more persistent as the disease progresses, until from the presence of abundant false membrane, together with œdema of the glottis, it becomes constant. In the majority of those cases the course of the disease is steadily from bad to worse, the voice becomes less audible, and the respirations become more laboured and stridulous. The difficulties of the inspiratory effort are indicated by the widely dilated nostrils, the facial expression of distress, the marked retraction in the suprasternal and supraclavicular spaces, the indrawing of the intercostal tissues and of the diaphragm. The face is pale and bathed in profuse perspiration, but as the obstruction increases, cyanosis, first observable in the lips, appears and soon becomes general.

The symptoms of laryngeal stenosis are so marked that those indicating **constitutional poisoning** become of secondary importance, but it must be borne in mind that, on account of this latter state, the child's strength is more rapidly exhausted. In the great majority of cases of laryngeal diphtheria, death results from asphyxia, due to narrowing of the air-way by exudation and œdema of the glottis. Exudation in some cases may extend from the larynx into the trachea, and even into the bronchi, and, occasionally, a more or less perfect cast of the larger bronchi may be detached and expelled, to the great, though in many cases but temporary, relief of the sufferer.

COMPLICATIONS AND SEQUELÆ.

Albuminuria.—Attention was first drawn to the occurrence of albuminuria in connection with diphtheria by Sir Willoughby Wade of Birmingham. It occurs at some period in the course of the disease in about half of all cases of diphtheria; it is rarely found before the third day, is most frequently detected between that day and the eighth, after which it is met with in a smaller proportion of cases. It cannot be looked upon as a diagnostic criterion between diphtheria and simple affections of the throat, since it is so frequently absent in diphtheria, and may be present in cases of simple sore throat from other causes.

Its presence, in cases of diphtheria, appears to indicate the degree of toxæmia, as it is most abundant where symptoms of constitutional poisoning are most marked, and it is frequently absent in those cases which are serious by means of the respiratory difficulties alone. Besides being albuminous, there is a diminution in the amount of urine secreted in all severe cases. Unlike the albuminuria associated with scarlet fever it is rarely accompanied by œdema of the tissues, and, as has been already stated, it occurs early in the course of diphtheria, while in scarlet fever its appearance is late, and is symptomatic of nephritis.

Adenitis and Cellulitis—Enlargement of the glands at the angle of the jaw occurs in almost every case of faucial diphtheria, yet the glands so affected rarely suppurate. Suppuration, however, may take place, in which case the process may be limited to the affected glands, or the inflammation may extend, producing a cellulitis of the neck, and rapidly leading to the formation of a large abscess.

Hæmorrhage.—Bleeding from the faucial and pharyngeal mucous membrane occasionally occurs, but is rarely of serious import. Epistaxis occurs frequently in cases of nasal diphtheria, and sometimes to an alarming extent.

Heart Failure.—During the first week of the illness the pulse may vary considerably. It may be very rapid or unduly slow. In the same individual it may at one time be irregular both in strength and rhythm, and at another time perfectly regular. The heart may become dilated, a



UNILATERAL PARALYSIS OF THE PALATE IN A NURSE AFTER DIPHTHERIA.

FIG. 73 shows the palate during quiet respiration when only a slight inequality is observable.

condition which may lead to syncope; or sudden death may result from exertion or excitement.

Paralysis.—So frequently does paralysis follow diphtheria that the estimate given by Gowers of 25 per cent. of all cases is regarded by authorities as moderate. Paralysis seldom occurs before the second or third week of the disease, and may not appear till after the lapse of six or eight weeks. It may follow the mildest case, in some of which its appear-

ance confirms an otherwise doubtful diagnosis, as well as the most severe: and the tendency to its occurrence increases with age, being most rare in infants. The paralysis is motor in type, although sensory phenomena occasionally occur. The soft palate is usually first affected, and, in the majority of cases,



FIG. 74 shows the position of the palate on deep inspiration, when the unaffected side is drawn upwards and outwards.

the paralysis is limited to this part. Speech then assumes a nasal character, and deglutition is so interfered with that fluids, especially if taken in quantity or hurriedly, regurgitate through the nose. The paralysed palate hangs loosely, and, when touched, it remains immobile, sensibility and reflex movements being alike abolished. The palate is usually affected as a whole, but occasionally the paralysis is unilateral, an instance of which is illustrated in Figs. 73 and 74.

In some cases disturbance of vision occurs, the most common lesion being paresis of the ciliary muscles, resulting in defective accommodation. Strabismus, ptosis, etc., may also result according to the muscles affected.

Paralysis of the muscles of the lower extremities follows next in frequency. It begins as a disturbance of sensation, followed by feebleness and interference with locomotion, producing a staggering gait, with loss of knee-jerk, and should it persist for any length of time, atrophy of the muscles may ensue.

The pharyngeal muscles are attacked in some severe cases, and as the power to swallow is in abeyance, saliva collects in quantity in the mouth, and food must be conveyed to the stomach through a tube.

When the muscles of the larynx are affected, which is of comparatively rare occurrence, variations in the voice result. Should the sensibility of the mucous membrane of the larynx be lost, there is danger of portions of food entering the larynx unknown to the patient, with, it may be, a fatal result.

Paralysis of the heart-muscle may occur in any case, and it may vary from slight and transient paresis to sudden and fatal paralysis. It occurs most frequently when convalescence has begun, and it is usually preceded by paralysis of the palate and fauces, except in those cases where it appears at an early stage of the disease. Then its onset is sudden, producing sickness, dyspnœa, and precordial oppression, the pulse becomes weak and intermittent, and death may be alarmingly sudden, or it may occur within a few hours. When slight, recovery may take place, but that form which occurs during convalescence is sudden in its appearance, and is usually rapidly fatal.

DIAGNOSIS OF DIPHTHERIA.

While a typical case of diphtheria is readily diagnosed, even by those who have had only a limited experience of

the disease, the most experienced practitioner is occasionally in doubt, particularly in the early stage of the disease, and in mild cases.

There are three characteristic features in a typical case :

- (1) The characteristic grey or greyish white pseudo-membrane.
- (2) Early swelling of the cervical glands.
- (3) The presence of the bacillus diphtheriæ.

Cases are met with at the beginning, and again towards the end of an epidemic of such a mild character as to cause one to hesitate to classify them as cases of diphtheria, and their true nature in many cases can only be determined by a bacteriological examination of a swab. Whether this modification is due to the infectivity of the specific poison being less than in a typical case, or whether the power of resistance on the part of the individual is sufficient to withstand the attack is an open question. It is, nevertheless, through the agency of such mild cases that the disease becomes widely disseminated, as they are apt to be overlooked, and the patient permitted to mix freely with his playfellows.

In the early stage, prior to the appearance of the false membrane, the injection of the fauces might readily pass for that accompanying simple catarrh. The one distinct sign of diphtheria is the pseudo-membrane, which, even in its most superficial form, is so intimately connected with the subjacent tissues, that, when it is removed, a raw surface is exposed. The exudation associated with follicular tonsillitis sometimes forms an element of doubt. Follicular tonsillitis, it may be repeated, is a totally distinct disease from diphtheria, but diphtheria may supervene on an attack of follicular tonsillitis, just as it may on other catarrhal inflammations of the fauces and pharynx.

The secretion in follicular tonsillitis oozes from one or more lacunal openings, is of a soft pultaceous character, lies loosely and quite superficially, is readily wiped off, there is

no abrasion of the surface exposed, and the spots disappear spontaneously by the third or fourth day. The local inflammation accompanying follicular tonsillitis is usually acute, and the temperature runs high, much higher than is usually met with when the diphtheria patch first appears; but, along with this, constitutional disturbance is comparatively slight, and there is entire absence of symptoms denoting toxæmia.

In some cases of diphtheria, particularly those due to milk—bovine infection—the patches of membrane may first appear at the mouths of the crypts, and the condition for the first twenty-four hours may closely resemble an acute follicular tonsillitis.

The affection of the throat in connection with scarlet fever, especially in cases in which the eruption is slight or has been overlooked, is sometimes mistaken for diphtheria. Where exudation is present in the early stage (in most cases excessive follicular secretion) the temperature is higher and remains elevated for a longer period than in diphtheria: there may be the characteristic strawberry-tongue of scarlet fever, the mucous membrane of the fauces and palate is deeply injected, the redness being often of a punctate character; and if the skin be carefully examined some evidences of the rash may be detected. At a later stage, the grey membrane on the tonsils is of the nature of a slough, the necrotic process is not limited to the mucous membrane, and on a close inspection of the skin desquamation may be detected. The absence of the Klebs-Loeffler bacillus in the secretions from the tonsil will serve to confirm the diagnosis.

“False” or “spurious croup” in children, the result of catarrhal laryngitis, laryngeal spasm due to gastric derangement, or stridulous laryngitis, often associated with dentition, may simulate and be mistaken for laryngeal diphtheria. But while the laryngeal symptoms in diphtheria come on slowly and become steadily more serious, the “croupy”

symptoms, associated with the other conditions named, begin suddenly, usually at night; there is an incessant deep-sounding "croupy" cough, the voice, though hoarse, is strong, and the severity of the symptoms soon passes away.

Scarlatina and **Diphtheria** may exist together in the same patient, and when this occurs the diphtheria is, as a rule, secondary to the scarlet fever. Diphtheria may appear similarly, though more rarely, in association with measles.

PROGNOSIS.

Prior to the discovery of the diphtheria antitoxin no epidemic disease occurring amongst children in this country was more dreaded than diphtheria. The prognosis in those days was always grave, though it varied in different epidemics, and at the different stages of an epidemic. The disease in the earlier cases might be mild, gradually becoming more virulent and more rapidly fatal as time went on, and again becoming modified in type towards the end of an epidemic. It was impossible to arrive at even an approximately correct death-rate in diphtheria, as many early and slight cases passed unnoticed, and therefore unnotified; but the average of all cases of genuine diphtheria was perhaps nearly fifty per cent., and in some epidemics, such as at Berlin in 1885, it proved fatal in 65·5 per cent.

The points which must be taken into consideration when making a prognosis are:

- (1) The treatment which has been adopted.
 - (2) The age of the patient.
 - (3) The parts which are implicated.
- (1) Where an efficient dose of antitoxin has been administered at an early stage of the disease, the prognosis is eminently good.
 - (2) The younger the child the greater is the danger. After seven years of age the risk diminishes with increase of age.

- (3) In **faucial** and in **nasal** diphtheria the primary danger is from toxæmia—and extension of the disease from the fauces to the nares adds to the seriousness of the attack, as the extension is quickly followed by profound toxæmia.

In **laryngeal** diphtheria death may occur from asphyxia or from pulmonary disease, without the occurrence of serious toxic symptoms.

The occurrence of œdema, of hæmorrhage, or of cardiac irregularity in the early stage add to the gravity of the illness.

Diphtheritic paralysis is dangerous to life only in proportion to the degree of interference with the heart's action, and with the muscles of respiration and of deglutition. Where the paralysis is limited to the soft palate, its duration is comparatively short, and there is no danger to life; and even where it is more extensive, recovery can in almost every case be reckoned upon, though the duration of the paralysis may vary from a few weeks to several months.

TREATMENT.

The treatment of diphtheria may be considered under the following divisions.

- | | |
|---------------------------|--------------------------|
| (1) The administration of | (3) General treatment. |
| antitoxin. | (4) Operative treatment. |
| (2) Local applications. | (5) Prophylaxis. |

(1) **Administration of Antitoxin.**

Diphtheria-antitoxin is injected subcutaneously, and the injection should be made into a part where the subcutaneous cellular tissue is abundant, such as over the abdomen, in the flank, or between the scapulæ.

Antitoxin is contained in hermetically sealed glass bulbs, and in its administration every antiseptic precaution should

be taken. The syringe, which should be large enough to hold the maximum dose, must be sterilised by boiling, and the skin over the seat of puncture must be well cleaned with soap and water and washed over with an antiseptic solution. When the contents of the phial have been drawn into the sterilised syringe, any air present should be carefully expelled. The skin is then pinched up between the left thumb and forefinger, and the needle attached to the syringe, which is held in the right hand, is then quickly pushed into the subcutaneous tissue. The serum is then injected very slowly. The needle should not be withdrawn until a few seconds have elapsed after all the serum has been injected. On its withdrawal the puncture may be sealed with a collodion dressing. The actual quantity to be injected will depend on the degree of concentration of the serum, and the strength, on the severity of the case to be treated. Absorption of the serum injected takes place rapidly, and the swelling and local discomfort caused by the injection usually disappear within a few hours.

In the employment of antitoxin to combat diphtheria three points should be attended to: (*a*) Early administration, (*b*) Fresh serum, (*c*) Efficient dose.

(*a*) **Early Administration.**—The best results are obtained where the serum is given at an early stage of the disease. So soon as the medical adviser suspects the presence of diphtheria, antitoxin should be administered. At the same time the throat should be carefully brushed over with a swab of sterilised cotton-wool and the secretions so removed examined for the bacillus. Injection of serum should never be delayed until a culture has been obtained: its early administration in all suspected cases will save much anxiety and many lives.

(*b*) **Fresh Serum.**—Antitoxic serum, whether in a hermetically-sealed phial, or treated by the addition of a preservative, tends to lose activity and become turbid, and

this occurs apparently quite apart from any change through decomposition. The most recently prepared serum obtainable should always be employed. Fresh serum is clear, and its use hypodermically is free from danger; serum in which there is a slight cloud, of secondary fibrin, but is without odour; is also safe: but serum which is turbid throughout is not only of doubtful value as a protective or antitoxic agent, but its injection may be followed by septic mischief.

(c) **Efficient Dose.**—What constitutes an efficient dose has been much discussed. My own practice is to give an injection of 3000 units as soon as the diagnosis of diphtheria has been arrived at; and a second injection of 2000 units from twelve to twenty-four hours later. Much larger doses are recommended by some authorities, and very large doses are given in the routine practice of several of our fever hospitals, and particularly in those cases which, when seen for the first time, display symptoms of profound toxæmia. By experiments on animals it has been shown that the amount of antitoxin required to save life increases at a rapid rate, according to the length of time which has elapsed between the injection of the virus of diphtheria and the administration of the antitoxic serum. Where the case is seen and recognised within the first forty-eight hours of the onset of the symptoms, the above doses will be found to be efficient.

Antitoxin of the highest potency should be selected, for it gives the maximum number of units of immunisation in the minimum quantity of serum, and its use minimises the subsequent discomfort.

Results following the Use of Diphtheria Antitoxin. (1) **In Diphtheria of the Fauces and Pharynx.**—In an average case there are some indications of the beneficial action of the antitoxin within twenty-four hours of the injection of a full dose, and the changes which occur are both constitutional and local.

The changes in the general condition consist of (*a*) a gradual lowering of the temperature, and if the temperature has been high, the fall will be all the more marked; (*b*) an improved state of the pulse; and (*c*) an improvement in the general comfort of the patient.

Locally there is (*a*) a diminution in the redness and swelling of the fauces; (*b*) the growth of the membrane may be checked; and (*c*) the patch of exudation may have become detached at its circumference. At the end of forty-eight hours, the injection having been repeated in the interval, there will be, in an average case of faucial diphtheria, further improvement in the general state of the patient; but the most palpable change is that in the local conditions. The most pleasing of these is separation of the membrane; portions break away and are expectorated or are swallowed, so that at the end of forty-eight hours from the first injection, little if any membrane remains, or if any portion is still present it is loosely attached and is inert. After being shed in this manner, I have not once seen it recur, as so frequently took place when the membrane was removed by force or by the use of solvent applications.

(2) **In Laryngeal Diphtheria.**—The good results which follow the use of fresh antitoxin, used early and in an efficient dose in cases of laryngeal diphtheria, is still more striking. I may best illustrate this by stating a case typical of many which I have seen in consultation. A well-nourished child, two years old, was seen by the family adviser for the first time on a Thursday morning; he diagnosed laryngeal diphtheria, and prescribed medicinal remedies. On the following day he asked me to accompany him to see the child, when I was informed that, three days before, the child had been apparently well, but that during the past two days it had suffered from increasing dyspnoea, with croupy cough and hoarse cry, and that throughout the whole

of the previous night it had been very restless. There were no patches on the fauces or pharynx, but there was marked laryngeal obstruction, with slight lividity of the lips. Temperature was 101.4° F.; pulse, 140; respirations, 42.

I had been called with the object of performing tracheotomy, but advised the use of antitoxin in the first instance, and at the same visit administered it. At 10 p.m. the temperature was 100.2° ; pulse, 130; respirations, 40. On the following morning (Saturday, 11 a.m.) the injection was repeated, the child's condition being very similar to that noted on the previous night. Twelve hours later the child had a fit of coughing, which apparently dislodged the membrane, for immediately thereafter the respirations were quiet and unobstructed, and the child fell into a deep sleep. On Sunday forenoon the pulse, which had fallen to 100, was regular and full, the temperature was 98.6° , and the respirations 24; and from this point the child was convalescent.

Alleged Injurious Effects.—It is said that albuminuria and paralysis occur much more frequently as sequelæ in those cases treated with antitoxin than in those who recovered without its use. Personally, this is not my experience, but if a larger number are so affected, the reason ascribed by those with extensive and varied experience of diphtheria in large fever hospitals may be the correct one—viz., that as recovery takes place in a larger proportion of serious cases now than formerly, observations on the subsequent course of severe cases, formerly precluded by death, are now possible.

Again, pains in the joints resembling those of acute rheumatism have been attributed to the use of antitoxic serum; and the appearance of urticaria, beginning usually about the eighth day near the site of the puncture and spreading over the trunk and extremities, has certainly resulted from the injection. Concentration of the serum has reduced the bulk of the injection, and, as a direct result,

these two ill effects are now much less common. With the object of preventing these complications it has been suggested to give calcium salts—the chloride or the lactate—on the ground that the occurrence of urticaria and pains in the joints are associated with if not due to a reduced coagulability of the blood. If the injection be given with due care and cleanliness, no other complications need be anticipated.

(2) Local Applications.

Formerly great stress was laid on the importance of local treatment, used to overcome the inflammation, to prevent the extension of the pseudo-membrane, and to remove what had already been formed.

But as the injection of antitoxin quickly affects the exudate, checks its extension, causes it to become loosened and discharged, after which it does not tend to form again, local applications in the average case are not now urgently required. With the object of keeping the parts perfectly clean, however, especially in cases where there is a mixed infection, and to aid in the separation of the membrane, it is often of advantage to have recourse to local medication, so long as its use is not resented by the patient, nor causes him to cry and struggle during the application.

In diphtheria of the fauces and pharynx, the parts affected may be sprayed or gently swabbed with an alkaline solution, such as :

R. Sodæ Bicarbonatis.
Potassæ Chloratis.
Sodii Chloridi āā gr. xij.
Aquæ Ment hæ Piperitæ ʒi. Solve.

Or hydrogen peroxide (15 to 20 volumes) may be similarly applied. Both solutions act as solvents, so that the clearing away of the membrane is apparently hastened by their use.

Where there are evidences of local septic mischief, or the odour of the breath is foul, the use of the solvent should be followed by the application of an antiseptic, such as glycerine of carbolic acid (1 in 8).

In **nasal diphtheria** the same alkaline lotion may be gently passed through the nostrils by means of a syringe, and after the retained secretions have been cleared away, peroxide of hydrogen, or a weak solution of permanganate of potash or other non-irritating antiseptic, may be sprayed into the nares.

In **laryngeal diphtheria** the laryngeal spasm present in the early stage may be relieved, and in the later stage separation of the membrane may be assisted, by the inhalation of steam, which may be applied by means of a Maw's inhaler, or the alkaline solution may be inhaled combined with steam by means of an Adam's or Seigle's spray. In the case of young children the air may simply be moistened by means of a "croup-kettle" or other suitable apparatus, but when steam is used in this way it is usually inadvisable to surround the bed with a tent, unless means be taken to remove the vitiated air.

(3) General Treatment.

As diphtheria is an acute infectious disease, the patient must be isolated, kept in bed in a well-aired apartment, and put on light nourishing diet.

In the average case the patient should be confined to bed for three weeks, and if the pulse be irregular or there be any sign of heart weakness, longer rest is necessary, and all forms of excitement must be withheld.

Should there be much vomiting, rectal feeding must be employed.

Prior to the introduction of antitoxin, innumerable medicinal preparations were recommended for the treatment of diphtheria, none of which, however, could be termed specific, although much was claimed for several of them. Their

importance and the necessity for having recourse to them has now become a matter of wholly secondary consideration, on account of the almost univocal use, and the efficiency, of antitoxin. Chief amongst these medicaments were (*a*) iron alone or combined with chlorate of potash, (*b*) iodide of potassium, (*c*) bichloride of mercury, (*d*) ammonia.

(*a*) **Iron** was chosen for its tonic and astringent properties, and so the *Liquor ferri perchloridi*, which contains a much larger proportion of free hydrochloric acid than the tincture, was the preparation preferred, and it was administered, as in the treatment of erysipelas, *in full doses frequently repeated*.

R. Liq. Ferri Perchloridi ʒiij.
Pot. Chlorat. ʒi.
Aq. Chloroformi ad ʒiv. M.
Sig.—Two teaspoonfuls a dose.

(*b*) **Iodide of Potassium** was employed in the treatment of diphtheria, largely on the recommendation of the late Sir Willoughby F. Wade of Birmingham. It was chosen on account of its eliminating powers; “it positively eliminates lead,” and its action in syphilis is presumed to be somewhat similar. Wade recommended it to be given in doses of from 2 to 4 grains, every two, three, or four hours, in conjunction with 5 to 10 grains of chlorate of potash, and along with large quantities of bland fluids. He says in his original article (*Lancet*, 1862), “I have known of no instance of a fatal termination, . . . and no instance of serious symptoms, or of secondary paralysis supervening where this plan of treatment had been rigorously carried out. The difficulty, especially with children, is in ensuring a copious supply of fluid. It exercises a speedy and salutary influence upon the general symptoms of the disease, and the exudation often diminishes with extraordinary rapidity.” Though many followed this line of treatment with satisfactory results, my individual experience did not

coincide with the beneficial results described by its originator.

(c) **Bichloride of Mercury** was strongly recommended by Jacobi in America, and by Dr. C. R. Illingworth in this country, on the ground of its action as an alterative and a germicide.

It was recommended to be given in hourly doses of from $\frac{1}{60}$ to $\frac{1}{40}$ of a grain, or more, according to age.

℞ Hydrarg. Perchloridi gr. i.
 Ammonii Chloridi ̄j.
 Pot. Chlorat. ̄ii.
 Aq. Menth. Pip. ad ̄vj. M.
 Sig. —A teaspoonful a dose.

Each dose of this mixture contains $\frac{1}{48}$ of a grain, and might be given in milk, or further diluted with water. The use of this salt of mercury must be carefully watched, as anæmia and prostration may quickly follow its administration in full doses.

(d) **Ammonia** had a strong advocate in the late Sir Benjamin Ward Richardson. It is a good antiseptic, and as an alkaline solvent, it had the effect of holding the blood in the fluid state, and of preventing the deposition of fibrine in the cavities of the heart, which so often led to a fatal issue. It was said that where it was employed, those changes in the nerves which result in paralysis occurred less frequently. The mode of administration adopted by Richardson was to give it in boiled milk, in the proportion of 4 grains of the carbonate of ammonia to each half-pint. The milk was sweetened according to taste, and then gently warmed to the temperature of new milk, and this mixture of food and medicine could be taken by the patient frequently and very freely.

If antitoxin be injected early in the course of the disease general medication is only required to combat symptoms as they arise.

Where the patient is anæmic iron may be given, either in the astringent form, or in a more stimulating form combined with ammonia.

When the pulse is irregular *nux vomica* or strychnine may be prescribed, and when necessary stimulants may be administered in the form of ammonia or alcohol in milk.

During convalescence tonics containing dilute hydrochloric acid, with strychnine and pepsin, may be given with advantage.

Where there is paralysis of the palate, as indicated by nasal speech and regurgitation of fluids through the nose during the act of swallowing, all fluids should be thickened, and food should be taken slowly.

If the pharyngeal muscles be also involved, nourishment should be given by means of a soft rubber-tube passed through the nose and into the stomach, or rectal feeding may be resorted to.

(4) Operative Treatment.

Where in laryngeal diphtheria there is increasing obstruction to respiration, recourse should be had to intubation or tracheotomy to relieve it.

So long as the exudation is confined to the larynx, intubation will afford relief: but when the membrane has extended to the trachea and bronchi, the trachea should be opened.

Intubation.—The instruments used for intubation of the larynx are those designed by Dr. O'Dwyer. The set consists of (1) a mouth-gag, (2) an introducer, (3) an extractor, (4) five tubes of varying sizes, each fitted with an obturator, (5) a scale for selecting the appropriate size of tube according to the patient's age, (6) a respirator for the surgeon's use.

The tubes are made of metal; they vary from $1\frac{1}{2}$ inch to $2\frac{1}{2}$ inches in length, are elliptical in shape, thus

exercising less pressure on the vocal cords than if cylindrical. The head is large, to prevent the whole tube passing through the glottis into the trachea, as occurred with the earlier forms, and there is a bulge in the middle of the tube which, together with its weight, prevents its easy ejection.

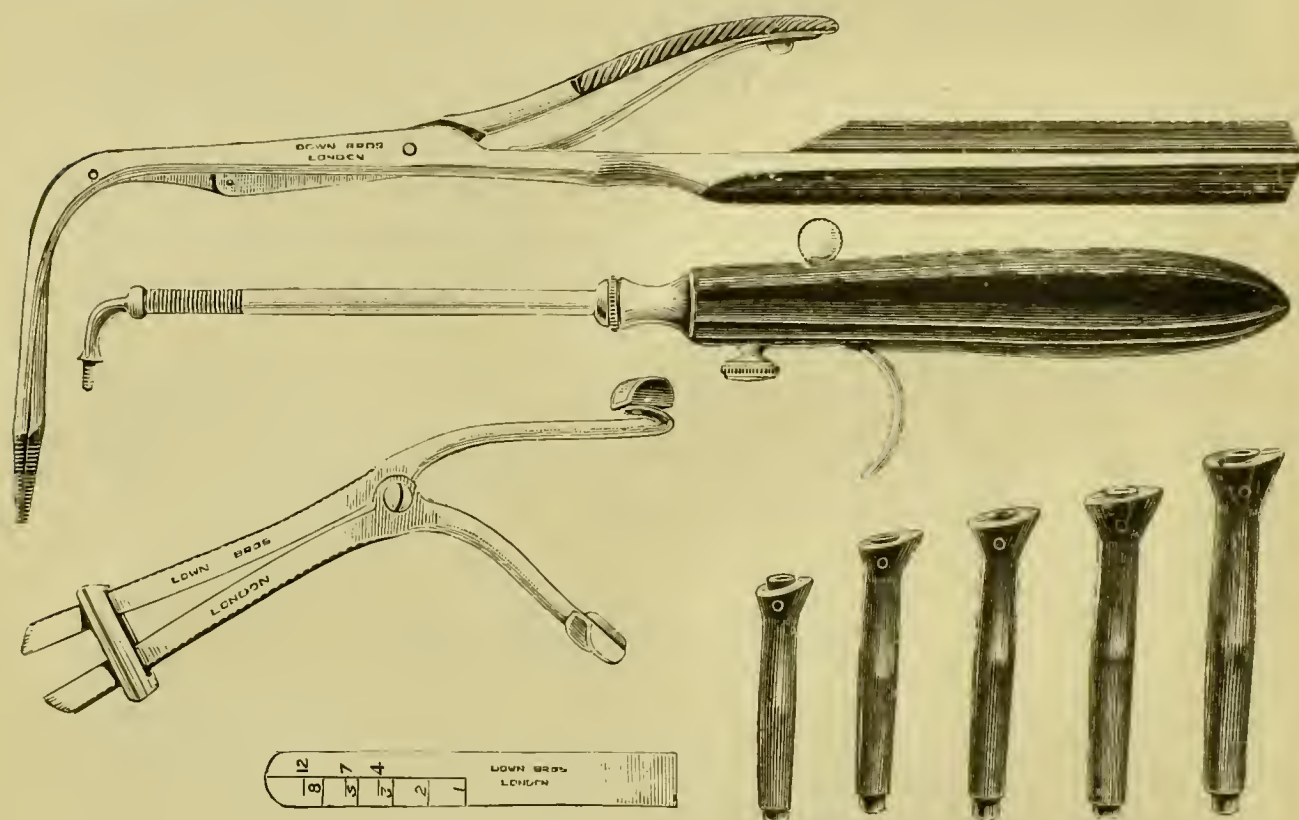


FIG. 75.—O'Dwyer's instruments for intubation of the larynx.

Introduction.—Having selected a tube in size suitable to the age of the patient, a thread is passed through the opening near the head, and a loop formed of about 18 inches. The obturator is then screwed upon the introducer and the tube attached. Thus prepared it lies at hand ready for use.

The child is placed on the nurse's knee, the hands and legs are fixed by the nurse, while the head rests against her left shoulder. When in this sitting posture the gag is introduced between the jaws on the left side and held there by an assistant from behind. The surgeon then takes up the introducer with tube, as prepared, catches the loop of

thread over the little finger of the left hand, and introduces the left forefinger into the mouth, so far that he can touch the epiglottis. The entrance of the finger is closely followed by the tube fixed on the introducer, the end of the tube is guided into the larynx by the tip of the left forefinger, and as it is passed over the epiglottis the handle of the introducer is raised, by which means the tube is brought into the line of the larynx. When the tube has entered the larynx, it is detached by pushing the knob on the introducer forwards, the introducer with obturator attached is withdrawn, and the tube pressed home by the point of the left forefinger. If the tube has entered the larynx there is an interval of violent coughing, then respiration becomes quiet, and when such is the case the loop of thread is passed over the right ear till the coughing subsides, when the loop may be cut and the thread withdrawn. If, on the other hand, the tube has been passed into the œsophagus, there is no such disturbance, there is no coughing, breathing is not relieved, and the loop of thread gradually gets shorter as the tube descends towards the stomach, and it should be at once withdrawn by traction on the thread.

As it is being pressed down into the larynx, the tube may get blocked by crowding down membrane in front of it, in which case the difficulty in respiration is increased and the tube must at once be removed, and re-applied after the obstructing mass has been cleared away.

Extraction.—When the further use for the tube is unnecessary, the patient is placed in the same position as for introduction. The extractor, guided by the left index finger or the laryngeal mirror, is passed over the epiglottis and into the tube, the limbs of the extractor are opened by pressure on the lever, the tube is grasped firmly and withdrawn.

In administering food while the tube is *in situ* the child may be laid across the lap on his back, with the head

well extended, or he may lie in the prone position with the head dependent. Food should be in fluid form, and given in small quantities at a time.

Tracheotomy.—The early performance of tracheotomy gives a patient a much better chance of recovery than when it is resorted to only after the appearance of stridor and cyanosis, and it should be performed as soon as it is shown that asphyxia cannot otherwise be averted. The case in which the most satisfactory result may be looked for is where the symptoms of general infection are slight, where the implication of the larynx has been a late, rather than an early feature, where the pulse is strong and regular, and the patient is over six years of age. But even in apparently hopeless cases where the true nature of the disease has been overlooked in the early stages, encouraging results may follow the opening of the trachea combined with the injection of antitoxin. No case however bad should be left untreated.

The Operation.—The patient wrapped in a warm blanket is placed on a table near a good light. Unless in extreme instances, where the patient, for instance, is becoming comatose or asphyxiated, chloroform should be administered, but with great caution. When anæsthesia has been produced, the pillow should be removed from under the head and a wine-bottle, wrapped in a towel, placed behind the neck to render the larynx prominent; or, and especially when dealing with very young children, the neck may be more fully extended by drawing the head well over the end of the table, so that the vertex is turned towards the floor, and placing a sandbag under the shoulders. The neck so exposed should be well sponged with an antiseptic lotion. The high operation is chosen as being more readily performed and freer from probable complications. The incision is made in the middle line from the upper edge of the cricoid cartilage downwards for fully one inch, and the

tissues are carefully divided down to the trachea, the vessels encountered being as far as possible held aside by hooks. The isthmus of the thyroid occasionally gives trouble, and care must be taken when it is placed unusually high to avoid incising it. Bleeding, which is venous in character and sometimes profuse, should be arrested before the trachea is opened, though where suffocation is threatened, too much time should not be lost in attempting to secure every vessel, as general venous oozing at once ceases from the relief afforded to the right side of the heart, when the trachea is opened, and a plentiful supply of air enters the chest. No attempt should be made to open the trachea until the rings are not only felt with the finger, but are visible. A sharp hook is entered through the front of the cricoid, and this is held by an assistant at the head of the table to fix the trachea in the middle line, and to draw it upwards and forwards. The knife is then inserted beneath the second or third ring, and the rings are divided from below upwards. The hissing noise of escaping air announces the opening of the windpipe, and care must be taken at this point *not* to remove the hook, as it should remain as a guide to the middle line of the trachea and to the position of the opening. The edges of the incision should be at once held apart by a dilator, or one edge may be grasped by catch-forceps, when mucus, blood, and possibly fragments of membrane will be expelled by the cough which follows the opening of the trachea. When respiration has become quiet, the tube is introduced. In all cases of laryngeal diphtheria the Foulis' cannula, though more difficult of introduction than some others on account of its being a rigid tube, will be found most satisfactory, as when in position it frets the parts less than a split cannula, and is more readily kept clean. The patient's head is then raised and laid on the table, the cannula is fixed with tape passed round the neck, the inner tube is introduced, and the patient placed in bed under a

tent. The air within the tent must be kept uniformly warm and moist, for which purpose a sponge wrung out of a hot antiseptic fluid, such as carbolic acid 1-60, may be placed on the neck and so covering the end of the tube that all air inspired is warmed and moistened by passing through it. The sponges should be changed frequently, each should be well wrung and distinctly hot on application, and be held in position by a scarf of gauze passed once round the neck. The inner tube should be withdrawn at regular intervals, or when there is evidence of obstruction, and cleared by passing a small bristle brush, or strip of gauze, through it.

When the operation is attempted on a patient *in extremis*, or should the patient become asphyxiated during the operation and even appear to be dead, *the operation should be completed in all cases*. I have more than once had a death on the table during the operation, where there was extensive exudation within the larynx and trachea, and which could not be removed in time to restore respiration; but I have also had several cases in which the child was comatose, so that no anæsthetic was necessary for the performance of the operation, and where by assiduous use of artificial respiration after the trachea was opened and cleared, consciousness was restored and life saved.

Though the operation is most simple on the dead subject, and is performed with comparative ease on the living when there is no hindrance to respiration, there is often considerable difficulty experienced in a case of laryngeal diphtheria in a young child with a short fat neck, whose veins are deeply congested from threatened asphyxia, and who is already in a state of exhaustion. Added to this is the freely mobile condition of the trachea, and the highly elastic nature of its walls in a young child. To the hurry and excitement of the operation and the fear that the child is ceasing to breathe, are due the accidents which occur during the performance of tracheotomy in cases of diphtheria.

After operation, general remedies and the regular administration of nourishment, and stimulants where necessary, must be continued as prior to the operation; and should any difficulty be experienced in swallowing, a soft rubber catheter may be passed through the nose into the gullet, through which a supply of suitable nourishment may be given regularly.

When **recovery** follows, the tube is rarely required after the eighth day, and in many cases it may be removed at the end of the second or third day. Occasionally where intra-tracheal ulceration has occurred, months may elapse before it can be dispensed with.

(5) Prophylactic Treatment.

During the prevalence of an epidemic of diphtheria, the health of children in the infected neighbourhood should be carefully watched, and nasal or faucial catarrh promptly treated. When one of a family is attacked, the patient should be placed in a well-ventilated, sparsely furnished room, and strictly isolated from other members of the family. If an insanitary condition of the house be suspected as a possible cause, other children of the family should be at once removed and kept under observation for a time, and an injection of 2000 units of antitoxin should be given to each child.

When the disease breaks out in a school, all scholars with bacilli in the throat should be isolated; and children from an infected household should not be allowed to attend school. As the bacillus may be found in the throat of a convalescent for many weeks after the illness, the child should be kept from school until a negative result is got on examination.

The free use of antiseptics in the sick room is a necessary precautionary measure which should never be neglected, and spoons, cups, glasses, etc., used by the patient should be cleansed by boiling.

CHAPTER XVII.

NEUROSES.

I. NEUROSES OF THE PALATE, FAUCES, AND PHARYNX.

NEUROSES of those parts may be either **sensory** or **motor** in character, and they may be caused by changes in the nerve centres—in Meckel's ganglion, in the nerve trunks or their terminals—or they may be the result of reflex-irritation.

1. When the **sensory** nerve supply is involved, the result may be (*a*) anæsthesia, (*b*) hyperæsthesia, (*c*) paræsthesia, or (*d*) neuralgia.

2. When the **motor** nerves are affected, there may be (*a*) spasm or (*b*) paralysis.

1. SENSORY NEUROSIS.

(*a*) **Anæsthesia**.—A diminution of sensibility of the palate and pharynx is frequently met with in patients suffering from syphilis; it may be observed in the hysterical; it occurs in some instances after diphtheria, and in bulbar paralysis. The imbibition or the application of some toxic agents, such as aconite, belladonna, carbolic acid, cocaine, etc., produces both anæsthesia and analgesia of those parts.

Analgesia in some rare instances is congenital and due to some physical defect.

(b) **Hyperæsthesia.**—Exaggerated sensitiveness may vary in degree from slight irritability to a painful susceptibility to the slightest touch. As we have marked tolerance to manipulation in syphilitics, so we frequently meet with increased sensitiveness in patients suffering from pulmonary tuberculosis, and the hyperæsthesia in those cases may be a barrier to a complete laryngoscopic examination. Irritability or hyperæsthesia of the palate and fauces may be associated with a deep general injection of the mucosa, as from excessive use of tobacco or alcohol, in which cases there is usually motor irritability as well, further adding to the patient's discomfort. Inhaling cold air causes pain in some cases, while in some extreme cases retching is induced by a bolus of food touching the palate or pharynx. Hyperæsthesia is sometimes associated with epilepsy.

(c) **Paræsthesia.**—Perversion of sensation takes many forms, and it may be confined to one spot, to one side of the throat, or to the faucial and pharyngeal regions generally.

The complaint may be that of a sense of irritation, tickling, itching, or burning, or it may be a feeling of constriction or choking, or swelling in the throat.

These symptoms, which sometimes cause the patient to fear the onset of some serious disease of the throat, are met with most frequently in women about the time of, and may be related to, the menopause; they may be excited by some disorders of digestion, or by a depressed state of the general health. Among direct causes is the lodgment of a foreign body, which, even after its removal, may leave a sensation of irritation or pain, as if the body was still present.

Atrophic pharyngitis, chronic follicular tonsillitis, with retained secretion, and the lodgment of inspissated secretion in the sulci of the pharyngeal tonsil, may each lead to perversion of sensation.

(d) **Neuralgia.**—Neuralgia of the palate and pharynx is uncommon, and when it occurs it is usually a reflected pain,

and due to disease in other parts. It may be of a constant gnawing character, or it may take the form of sharp lancinating pains. It may be caused by inflammation or new growth of the middle ear, by early malignant disease in the naso-pharynx, by malignant ulcers of the pharynx, and by inflammatory affections of the cervical spine. Some cases are due to anæmia and others to gout or rheumatism, and in the latter there may be no detectable objective cause, although the pain may be described by the patient as distressing or even excruciating.

Treatment.—Where any tangible cause is discovered, it should be remedied or removed.

Errors in diet and in the habits of life generally should be corrected; and the use of local irritants, whether in the form of condiments, tobacco, or alcohol should be studiously avoided.

Anæmia should be treated with preparations of iron and arsenic, and gout and rheumatism by appropriate remedies.

While it is unwise to prescribe sedatives as routine treatment in neurotic cases, yet good results are obtained by a short course of the bromides combined with hyoscinum, particularly in those cases of hyperæsthesia occurring towards the menopause.

The beneficial effect of change of air and scene is very great, in many cases occurring in those whose health is low, and in those who lead a sedentary life. Where there is no serious affection of the parts, the patient should be assured of that fact, for the relief of mind afforded thereby will often effect a cure.

Local medication in neurotic patients is often harmful, as the repetition of the application draws his attention afresh to his symptoms. Where, however, there is any local lesion, a granular pharyngitis, chronic tonsillitis, hypertrophy of the lingual tonsil, etc., local medication or operative treatment should be adopted.

In cases of anaesthesia the Faradic current may prove useful. In neuralgia the application of iodine and aconite, or the very limited use of cocaine lozenges, may afford very considerable relief in some cases.

2. MOTOR NEUROSES.

Motor neuroses of the soft palate, fauces, and pharynx may occur in the form of (a) *spasm* or (b) *paralysis*.

(a) Spasmodic Affections of the Fauces.

Spasm of the fauces and pharynx may be purely reflex in origin; may be due to a local lesion; or may depend on disease of the higher nerve centres.

The symptoms are of three varieties: (i) *globus hystericus*, (ii) choreic movements, (iii) nystagmus.

(i) **Globus hystericus**, which is probably due to a spasmodic contraction of the pharyngeal muscles, is met with in

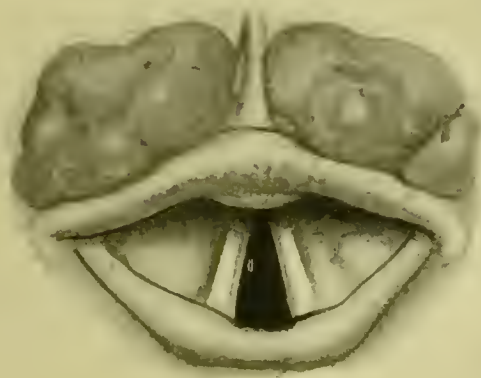


FIG. 76.—Hypertrophy of the lingual tonsil. Here, as is occasionally seen, the glosso-epiglottic fossæ are filled with the hypertrophied gland-tissue.

hysterical women. But it may be met with in others, and is not always a symptom of hysteria. The sensation of a “lump rising in the throat,” which is the symptom complained of, may be a reflex neurosis excited by turbinal or other intra-nasal hypertrophy, or it may be, and more commonly is, the result of direct pressure of hypertrophied lingual gland tissue on the epiglottis.

(ii) **Choreic movements**, or irregular jerky contractions of the soft palate, the faucial pillars, and of the lateral walls of the pharynx, may be observed in children suffering from chorea, and in some cases of paralysis agitans. Similar contractions of the pillars of the fauces may be seen in some highly-strung neurotic individuals.

(iii) **Nystagmus**, a term better known in ophthalmology, and descriptive of the spasmodic oscillatory movements of the eyes seen in miners, is here applied to rapid rhythmic contractile movements of the muscles of the palate, pharynx, and, occasionally, of the floor of the mouth and of the larynx. It may be due to a reflex irritation excited by intra-nasal or post-nasal conditions, or may depend on some serious intra-cranial lesion.

The rapid contractile movements of the palate sometimes produce a clicking sound audible to those around.

Treatment.—In hysterical and purely neurotic cases, treatment must be conducted on general lines. Attention to diet, avoidance of tea and stimulants, exercise out of doors, and temporary change of life and scene, will act beneficially; and the administration of valerian, asafoetida, or bromide of potassium will hasten the disappearance of the local symptoms.

Local pathological conditions which may excite spasms by direct contact or through the reflex mechanism should, when present, be removed if possible. In cases of spasm, chorea, or nystagmus, dependent on a lesion of the central nervous system, the pharyngeal symptoms are usually of minor importance, and are but an episode in the course of the disease.

(b) **Paralyses of the Palate, Fauces, and Pharynx.**

The paralysis may be confined to the soft palate, or it may extend to the muscles of the pharynx, and it may

affect one or both sides. It may be due to a variety of causes, amongst which are :

- (i) Affections of the palatine and pharyngeal muscles.
- (ii) Peripheral toxic neuritis.
- (iii) Disease or injury of the nerve trunks.
- (iv) Lesions of the nerve centres.

(i) **Myopathic.**—Some acute inflammatory conditions of the palate, fauces, and pharynx, such as an acute parenchymatous tonsillitis, and the inflammatory swelling of the parts which may follow the operation for the removal of adenoids, etc., may lead to a mechanical immobility of the palate.

This condition, though spoken of as a paresis, is not a true paralysis, but may be looked upon as a myositis, and is usually of short duration.

(ii) **Peripheral Toxic Neuritis.**—This is usually the result of systemic toxæmia, and diphtheria is the most common cause. It may also follow influenza, and acute follicular tonsillitis, and it has been observed in cases of both lead and arsenic poisoning. The paralysis arising from toxæmia is usually bilateral, but is occasionally unilateral, as in the case depicted on pages 330 and 331, which occurred after diphtheria in a hospital nurse.

(iii) **Disease or Injury of the Nerve Trunks.**—Injuries to the pharyngeal nerves in their course, or pressure on them exerted by new growths, enlarged glands, or gummata, will lead to paralysis on the side affected.

(iv) Paralysis of the palate and pharynx occurs in both **bulbar paralysis** and in **tabes dorsalis**.

Symptoms.—The subjective symptoms of paralysis of the palate, fauces, and pharynx are nasal speech, imperfect articulation, and impairment of deglutition.

The speech resembles that due to cleft palate, and when the patient attempts to drink, a portion of the fluid returns through the nose. In cases where the constrictors of the

pharynx are also paralysed, deglutition becomes more difficult, and in some cases is well nigh impossible. When the paralysis of the palate is bilateral the palate hangs loosely downwards, and it does not move on phonation, nor is muscular movement excited by touching it with a probe.

When it is unilateral, the affected side usually extends to a lower level than the other, and when the patient inspires deeply it is drawn towards the sound side (Fig. 74).

Treatment.—In myopathic cases no very active treatment is required. A solution of nitrate of silver (gr. x.— $\bar{3}$ j.) may be applied over the surface every alternate day for one week, and the parts may be kept clean by the use of a weak antiseptic solution, used as a mouth-wash or sprayed over the fauces and pharynx.

In toxic cases, such as follow diphtheria and influenza, the best results are obtained from the free use of iron and strychnine: and in some cases recovery may be hastened by the use of the faradic current. As the child gains strength, breathing and phonatory exercises may be employed to more completely overcome the defects in speech.

In cases due to metallic poisoning, treatment directed to the elimination of the particular substance in play must be promptly had recourse to. Diseases and injuries affecting the nerves must be treated according to their nature. New growths pressing upon or involving the nerve should be removed, and injured structures restored where this is possible, and gummata should be treated with the iodides.

II. NEUROSES OF THE LARYNX.

Neuroses of the larynx are divided, as are those of the pharynx, into sensory and motor neuroses. The sensory group comprise anæsthesia, hyperæsthesia, paræsthesia, and neuralgia, and the motor neuroses take the form of paralyses, and spasmodic affections.

1. SENSORY NEUROSES.

The superior laryngeal nerve is the source of the sensory supply to the laryngeal mucous membrane.

(a) **Anæsthesia.**—Partial or complete loss of sensation over the mucous membrane of the larynx is a rare condition. In the majority of cases it occurs as a sequela of diphtheria, and is then usually associated with anæsthesia of the soft palate and pharynx. Among other conditions which may lead to a peripheral neuritis with similar results are syphilis and lead poisoning.

Injury to the superior laryngeal nerve may produce hemi-anæsthesia of the surface supplied by it. General anæsthesia of the larynx may be due to bulbar paralysis, and it is sometimes met with as an early symptom of general paralysis.

Symptoms.—There is a variable degree of difficulty in swallowing. On account of the absence of sensation, the protective function of the larynx, acting through the reflexes, is in abeyance, and so food particles and fluids readily gain entrance to the larynx, and when these pass beyond the insensitive area they excite attacks of coughing and choking.

On examination the parts may appear to be normal, but the application of a laryngeal probe under the guidance of the eye will demonstrate the insensitive state of the mucous membrane.

Diagnosis.—The diagnosis is determined by the symptoms complained of, and the insensitiveness of the laryngeal mucous membrane when touched with a probe.

Prognosis.—When this condition follows diphtheria, recovery almost always takes place, and the anæsthesia usually passes away in from three to six or eight weeks from the time of its appearance. When the neuritis is due to metallic poisons recovery is a much slower process.

In cases dependent on a central lesion, recovery of sensation is not only unlikely, but the anæsthetic state of the laryngeal mucosa is a menace to the patient's life from the readiness with which food may enter the windpipe and lead to pneumonia.

Treatment.—The most important consideration in treatment is to secure to the patient a plentiful supply of nourishing food. When sensation over the laryngeal mucous membrane is completely lost, the fear of being choked often aggravates the condition, and feeding at regular intervals by means of an œsophageal tube becomes a necessity. In its introduction in those cases great care must be taken that it is passed into the gullet, and not into the trachea.

Medicinal treatment consists chiefly in the use of preparations of iron, strychnine, and arsenic; and in persistent cases, electricity locally may be employed. A gentle Faradic current, with one pole over the neck, in the course of the superior laryngeal nerve, and the other (a laryngeal electrode) applied to various points over the paralysed area, but particularly to the anterior part of the pyriform fossa, is the most direct way of hastening recovery.

(*b*) **Hyperæsthesia.**—Exaggerated sensitiveness of the larynx, like hyperæsthesia of the fauces, may vary from slight irritability to a painful susceptibility to the slightest touch. This hyperæsthetic state is sometimes associated with the early stage of pulmonary and laryngeal phthisis: it may be due to the excessive use of alcohol, tea, and tobacco, and to disorders of digestion, particularly in neurotics.

Symptoms.—These may take the form of a constant intra-laryngeal irritation, causing a frequent coughing, which is aggravated by the use of the voice. Attempts to examine the larynx excite exaggerated reflex movements, and even palpation of the larynx externally may excite coughing and retching.

(c) **Paræsthesia.**—Perversion of sensation is less frequent in the larynx than it is in the pharynx.

The feelings complained of may be localised or general, and they may take the form of pricking, of burning, of tickling, of a lump in the throat, or as if a hair had gained entrance to the larynx.

Diagnosis.—Apart from anæmia of the mucous membrane no objective evidence of disease will be found, but there may be other indications of the neurotic temperament, the presence of which will aid in the diagnosis.

(d) **Neuralgia.**—Neuralgia of the larynx may be caused by both gout and rheumatism. But it is of rare occurrence apart from the presence of some serious disease, chief amongst which are malignant and tubercular ulcerations.

Treatment.—The possibility of early phthisis in cases of hyperæsthesia must be borne in mind. In most cases general tonic treatment is necessary, and the use of tobacco and stimulants should be prohibited. Much good is sometimes obtained in hyperæsthesia from the use of sedative steam inhalations. When the patient is anæmic, iron, particularly with ammonia and with or without arsenic, should be given; and in neurotics, a short course of the bromides is often attended with excellent results.

When the patient is apprehensive of the appearance of tubercular, syphilitic or cancerous lesions, he should, when there is no ground for his fears, be assured on this point.

In paræsthesia counter-irritation applied over the larynx is occasionally of great service, and the Faradic current in other cases is equally beneficial.

In neuralgic cases the local application of sedatives is sometimes called for. They should always be applied by skilled hands, and, particularly in the case of cocaine, should never be left in the hands of a neurotic patient.

2. MOTOR NEUROSES.

Muscles of the Larynx.

Before entering upon a consideration of the **motor neuroses**, it may be of advantage to enumerate the **special muscles** of the larynx which regulate the position and tension of the vocal cords. These are divided according to their action into adductors and abductors, and into tensors, relaxers, and sphincters.

1. The **adductor muscles** are :

(a) The transverse *arytenoideus*, a single muscle which unites the posterior surfaces of the arytenoid cartilages, and by its contraction draws those cartilages together.

(b) The *external* and *internal thyro-arytenoidei* muscles. Both sets are in pairs, and each is so attached to the outer sides of the arytenoid cartilages that, on contraction, they cause rotation of the vocal cords towards the middle line.

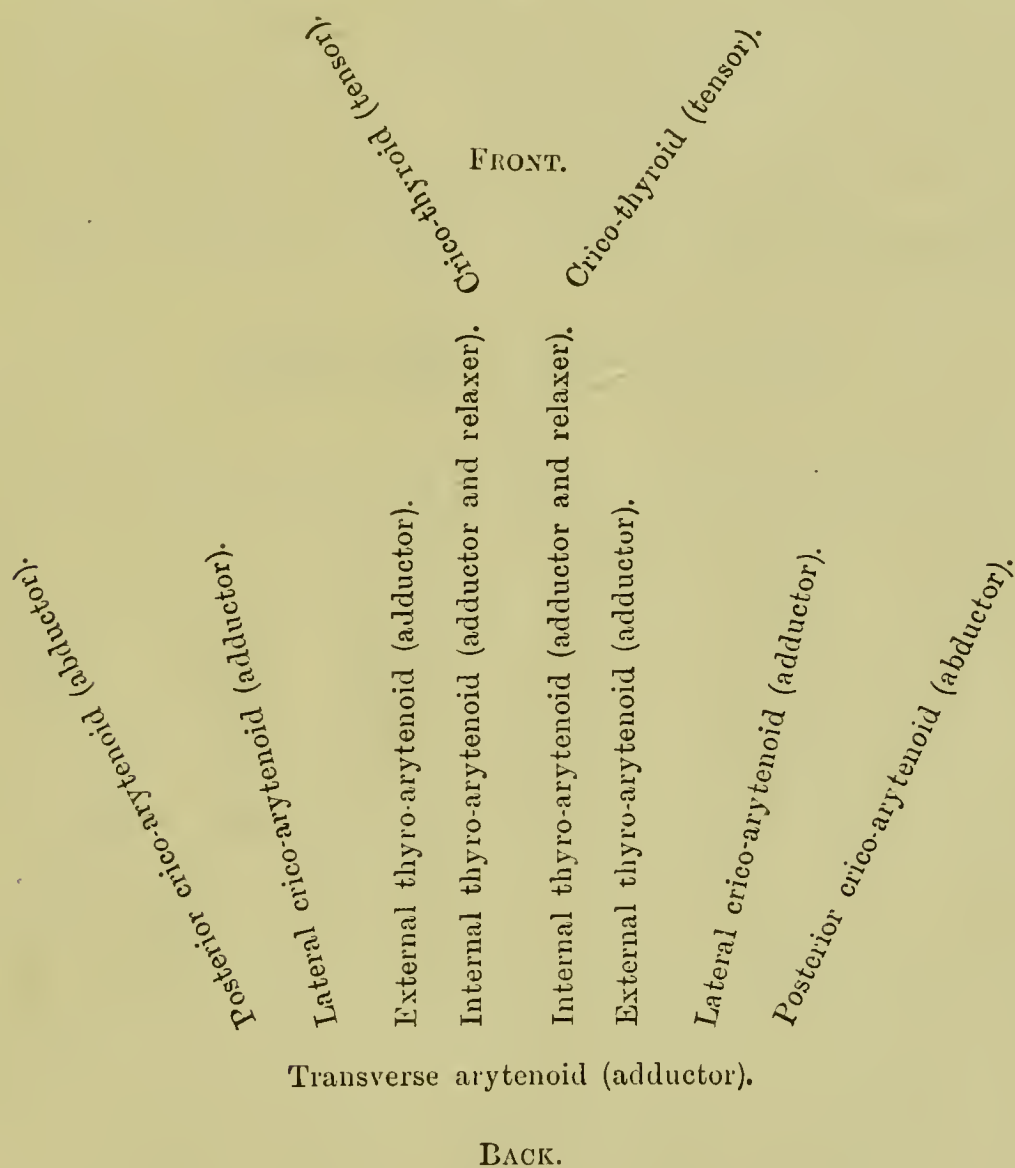
(c) The *lateral crico-arytenoidei* muscles (one pair), each of which is attached to the outer angle of an arytenoid cartilage, and, on contraction, pulls this angle forwards, thus throwing the *processus vocalis* inwards.

2. The **abductors** consist of the two *posterior crico-arytenoidei* muscles, each of which, passing from the posterior surface of the cricoid cartilage to the outer angle of the arytenoid cartilage, pulls back the outer angle and causes the *processus vocalis* to rotate outwards.

3. The **relaxers** of the vocal cords are the *internal thyro-arytenoidei* muscles. These, when acting alone, pull the thyroid cartilage upwards and backwards, and by lessening the distance between the thyroid and arytenoid cartilages, relax the vocal cords as a whole. When they cease to act the elasticity of the ligaments of the larynx again restores the state of equilibrium. But some of the fibres of these muscles (described sometimes as the *aryvocalis muscles*) are inserted into the vocal cords, and these when they contract

may tighten portions of the cords, while at the same time they relax the parts behind.

4. The chief **tensors** of the vocal cords are the *cricothyroid* muscles, right and left. This pair of muscles, on contraction, produce rotation of the thyroid on the cricoid cartilage in a forward and downward direction, and by this movement the distance between the arytenoid and thyroid cartilages is increased, resulting in heightened tension of the vocal cords.



5. The sphincters or closers of the larynx.

The muscles which close the larynx during the act of deglutition are referred to as the sphincters of the larynx.

They consist of the *adductor* muscles generally, together with the *thyro-epiglottidei* muscles, which act as depressors of the epiglottis, and the *aryteno-epiglottidei* muscles, which narrow the upper aperture of the larynx.

The position and function of the individual muscles which regulate the movements and tension of the vocal cords may be arranged diagrammatically as shown on previous page.

The **adductors** form the stronger set of muscles, and being the muscles of **volition**, inefficiency in their movements is frequently of a functional character.

The action of the **abductors** is of a **reflex** nature, is an involuntary respiratory movement, and impairment of their movements is usually the result of some organic lesion.

Nerve Supply of the Larynx.

The nerve supply of the larynx is derived from the pneumogastric, through two pairs of special branches, the superior and the inferior, or recurrent, laryngeal nerves. The pneumogastric at its origin is a sensory nerve, but it receives motor fibres from the spinal accessory, so that it possesses both sensory and motor elements above the point at which the superior laryngeal nerve is given off.

The **superior laryngeal nerve** is the sensory nerve of the larynx, but it contains motor as well as sensory fibres. It is the nerve of sensation for the whole of the laryngeal mucosa, and it is the source of motor nerve supply to (1) the *crico-thyroid* muscle, the muscle which, when contracted, renders the vocal cords tense for the production of high notes, and (2) to the depressors of the epiglottis, namely, the *thyro-epiglottic* and the *aryteno-epiglottic* muscles.

The **recurrent laryngeal nerves** are purely motor nerves, and they supply all the special muscles of the larynx, with the exception of the crico-thyroid, which derives its motor

supply from the superior nerve. Each recurrent nerve contains both abductor and adductor fibres. These have been traced to separate centres in the cerebral cortex, and the centre for each set has a bilateral function.

The *adductor centre* is situated in front of the ascending frontal gyrus. If this centre in one of the hemispheres is destroyed, no paralysis follows; and further, if after the destruction of this centre in one hemisphere, the centre on the opposite side be stimulated, bilateral adduction of the vocal cords results, as if both centres were intact. Thus unilateral adductor paralysis cannot be caused by a lesion of the cerebral centres.

The *abductor centre* lies in front of and below the anterior extremity of the coronal sulcus. Here again the centre in each hemisphere has a bilateral function, and stimulation of the centre on one side results in bilateral abduction of the vocal cords.

The practical result of this knowledge is that a unilateral paralysis of the vocal cords, either of the abductors or the adductors, can never be due to a central lesion.

Although both the abductor and adductor muscles obtain their nerve supply from the recurrent laryngeals, yet it is a fact, attention to which was specially drawn by Sir Felix Semon, that the abductor muscles are invariably affected before the adductors, in all cases of pressure on the recurrent nerves, and in all cases of progressive organic lesions of the centres or trunks of the motor laryngeal nerves.

Disease of the medulla oblongata, affections of the spinal accessory and of the trunk of the pneumogastric nerves, on either or both sides, result in impairment of the movements of the laryngeal muscles; but the impairment in all these cases is associated with other, and in all probability, more serious paralyses.

Here attention will be chiefly directed to those conditions which result from interference with the laryngeal nerves

in their course, or to those affections where the laryngeal element is the prominent feature.

I. PARALYSES OF THE LARYNX.

Paralysis of the laryngeal muscles may be due to some functional cause, or may result from disease of, or pressure on, the nerves supplying the muscles of the larynx; or the inability to move the muscles may be caused by disease of the muscles themselves.

The resulting paralytic affection may be confined to one muscle or to one group of muscles, and one or both sides may be affected, causing a unilateral or a bilateral paralysis.

I. Paralysis of the Muscles supplied by the Superior Laryngeal Nerves.

(a) **Paralysis of the External Tensors.**—Paralysis of the circo-thyroid muscles is rare.

Etiology.—It may be *unilateral*, in which case it is usually due to injury to, or pressure on, the superior laryngeal nerve on the affected side.

Where it is *bilateral* it is, in perhaps every case, the result of diphtheria.

In both instances the motor paresis may be accompanied by impairment or complete loss of sensation over the laryngeal mucosa, above the level of the vocal cords.

Symptoms.—Where unilateral, the affected cord remains flaccid, and where bilateral the lack of tension is indicated by flabbiness of the cords, the free edges of which may be wavy in outline, or concave towards the middle line. The patient's voice is deep and rough, and he is unable to modulate it. If he tries to vocalise, it will be found that he cannot long continue to produce the same note; and his voice gradually descends in the scale, although he tries

to keep to the original note, and even strains the muscles in front of the neck and depresses the chin in his attempts.

(b) **Paralysis of the Sphincters of the Epiglottis.**—When the superior laryngeal nerve is completely paralysed, there is paralysis of the thyro-epiglottidei and the aryteno-epiglottidei muscles as well as of the external tensors, together with loss of sensation, over the laryngeal mucosa.

Etiology.—This form of paralysis chiefly occurs as a sequel of diphtheria, in which case it is of the nature of a toxic peripheral neuritis. Syphilis may be, though rarely is, the determining cause.

Symptoms.—As the external tensors are affected, the voice is lacking in power, and is hoarse and rough. The loss of the sphincter action, together with the absence of sensation, permits of the easy entrance of food particles and fluids into the larynx. If this does occur, the accident is followed by spasms of violent coughing and choking; and the possibility of this occurrence lays the patient open to the risk of pneumonia.

Treatment.—When the paralysis is of diphtheritic origin, the use of strychnine and electricity in the form of the Faradic current are of distinct service in restoring the parts to their normal condition. If there be any ground to suspect syphilis as the cause, grey powder should be given in addition to the iodide of potassium or other mercurial preparation. When, on the other hand, the paralysis is due to some local lesion, treatment will depend on the nature of that lesion. If, for instance, there has been an inflammatory affection of the nerve or its sheath, a series of blisters applied along its course, and especially in the neighbourhood of the greater cornu of the hyoid bone, along with the internal use of the iodide of potassium, may be adopted with benefit. When the paralysis results from pressure, the removal of the cause where possible by local applications, or by operation, may enable the nerve to become active again.

II. Paralysis of Muscles supplied by the Recurrent Laryngeal Nerve.

Paralysis of the Abductor Muscles.—The paralysis may affect one side only, or both sides may be involved. Cases of **unilateral** paralysis are not uncommon, while **bilateral** paralysis of the abductors is a rare condition.

(a) **Unilateral Abductor Paralysis.**—One-sided paralysis of the *posterior crico-arytenoidei* muscles is the most common form of laryngeal paresis, and occurs chiefly in adults.

Etiology.—The cause may be either myopathic or neuropathic in character. Cases due to a myopathic cause are rare, and usually follow some more or less chronic inflammatory affection. Where it is due to failure of the nerve supply, the cause may be found in injury to, or pressure on, the vagus in the neck, though the commonest cause is pressure on one of the recurrent laryngeal nerves exerted by an aneurism of the aorta, by tumours of the mediastinum, malignant disease of the œsophagus or of the thyroid gland, by tubercular glands or by gummata. On the right side the recurrent nerve may be pressed upon by aneurism of the right subclavian or innominate arteries, or by a condensation at the apex of the right lung, or the nerve may be incorporated in adhesions following an apical pleurisy.

The most common **cause** is aneurism of the arch of the aorta, and the left side is more frequently paralysed than the right. This is explained by the difference in the relations of the two recurrent nerves, and by the longer course pursued by the left one. The left branch is given off at a much lower level than is the right, and as the left leaves the trunk of the pneumogastric, it passes beneath and then immediately behind the aorta, and is in such close proximity to the artery, that it is readily affected by any increase in the size of that vessel.

Symptoms.—In unilateral abductor paralysis, the subjective symptoms will be found to vary considerably in different cases. Quiet respiration may be unimpeded, but a certain amount of difficulty, amounting in some cases to stridor, may be experienced during exertion. The voice may be perfectly clear or but slightly altered. In some cases no appreciable change in the voice can be detected, but occasionally it is rough, and from the difference in tension of the two cords, the sound produced may be discordant in character.

The sound accompanying a cough is usually clear, or, if altered, the change is of the nature of huskiness.

Diagnosis.—On laryngoscopic **examination** this condition is readily detected. The vocal cord on the paralysed side

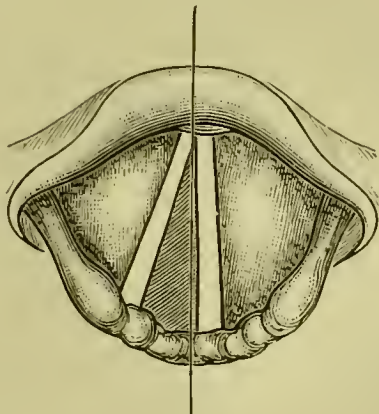


FIG. 77a.

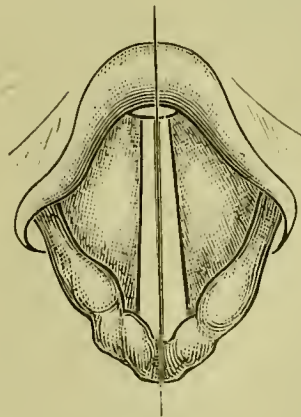


FIG. 77b.

Paralysis of the abductor muscles on the left side. (a) Position of the parts during quiet respiration. (b) Position of the parts during phonation.

remains fixed in the middle line. During *phonation* it occupies the same position as in health, both cords meet in the middle line and the note emitted is clear; but when a full *inspiration* is taken, the paralysed cord is observed to remain unmoved, while the cord on the sound side moves quickly outwards, it is rapidly and fully abducted.

In the earlier stages of abductor paralysis from pressure, the appearance of the larynx, under varying conditions, is interesting. For example, in the examination of the larynx

in cases of suspected aneurism, the larynx may be found to be perfectly healthy in appearance, and abduction apparently complete and equal on the two sides; while in the same case, after some little exertion on the part of the patient, some little difficulty in respiration may be exhibited, and, on examination, a relative deficiency in the outward movement of one of the cords during a deep inspiration may be observed. This may again disappear when the effect of the exertion or excitement on the heart has subsided.

To discover the source of pressure on the nerve, a careful examination of the neck and chest is necessary, and much valuable information can be obtained as to the presence, size and situation of new growths within the chest by means of the X-rays.

Prognosis.—Unilateral abductor paralysis *per se* does not endanger life, but the determining cause of the paralysis may be of the most serious nature. The prognosis therefore depends on the cause.

Where the paralysis is due to the presence of some former glandular disease, to a bye-gone pleurisy or pneumonic consolidation, or to injury of the nerve, there may be no immediate danger to life though the paresis may not be improved by any form of treatment.

If the paralysis is the result of pressure of an aneurism or malignant disease, whether in the mediastinum, the thyroid or the gullet, the prognosis is most serious.

The following **two cases** of unilateral paralysis of the abductors are of more than usual interest, one on account of the early age at which complete paralysis occurred, and the other as illustrating the value of the lesion as an early indication of deep-seated disease.

The first case was seen by me in the Royal Hospital for Sick Children, at the request of the late Dr. Finlayson, and it was published by him in the *Archives of Pediatrics* for September, 1893. The following quotation from that report

relating to the laryngeal lesion may be given on account of the rarity of the case :

“ On visiting the Children’s Hospital on May 2nd I was astonished to hear a peculiar cough, such as I had never heard in a child. On inquiring who had the cough, a child of four and a half years was pointed out, and I found that the child had just been admitted that day. The cough resembled the most extreme form of hoarse cough met with in aneurysmal disease complicated with laryngeal paralysis. The first point was to ascertain whether there was any local disease in the larynx to account for the strange cough. Dr. Walker Downie was asked to examine the larynx next day, but no swelling, ulceration, or disease of the mucous membrane was present. There was, however, paralysis of the left vocal cord, as regards abduction, so that it remained fixed close to the middle line, while the right moved freely. This cleared the way for the diagnosis. The symptoms and physical signs pointed to consolidation and softening from phthisical disease, in the left lung in particular ; and the absence of any tubercular disease in the larynx seemed to me to make it very certain that the case was one of the class referred to, where implication of the recurrent laryngeal nerve had been brought about by the pressure of glands, or the matting of pleuritic adhesion. The child was extremely rickety, and the family history was highly tubercular. The patient died after two weeks’ residence in the hospital, and a post-mortem examination was made by Dr. Joseph Coats, of which the following is the summary : ‘ Phthisis pulmonalis, caseating bronchial glands, involving the left recurrent nerve. Peritonitis (tubercular) with glueing of liver, stomach, and spleen ’ ; and the following paragraph from the full report is specially interesting : ‘ Tracing the left pneumogastric nerve, it becomes adherent to a much enlarged and caseating gland, but can be traced down without much apparent alteration of structure to the level of the root of the lung. The adhesion begins just above the off-giving of the recurrent nerve. This nerve is intimately connected with, and involved in, caseating glands, almost from its origin, so that it is with difficulty traced round the aorta : it appears to be spread out and its substance involved in the infiltration.’ ”

The second case was that of a ship’s carpenter, aged 55, who became hoarse in April, 1892, and was sent to me by his medical adviser. Throughout his whole life he had

enjoyed the best of health. I saw him early in May, when he complained of hoarseness, frequent cough, and shortness of breath on exertion. On laryngoscopic examination there was paresis of the abductor muscles on the left side, along with a general injection of the mucous membrane of the larynx. No intra-laryngeal cause could be detected, and, though he expressed himself as being perfectly well and strong, and simply annoyed by the condition complained of, pressure deep in the mediastinum was evident, and, though aneurism was suspected on general grounds, the exact nature of the lesion could not then be determined. His chest had been carefully examined on several occasions with negative results. Rest in bed, the use of hot inhalations, and the administration of iodide of potassium, were prescribed. At the end of three months his voice is stated to have become clear, and is said to have remained so for fully nine months, when it again became husky, and speaking was performed at the expense of considerable effort. On examining the larynx, seventeen months after the first inspection, the left vocal cord was seen to occupy the cadaveric position and to be curved, with the concavity towards the middle line, indicating complete recurrent paralysis on the affected side. In order that the condition of his chest might be thoroughly investigated, he was transferred from the Throat department to one of the Medical wards, where he was placed under the care of the late Professor Gairdner and Dr. Hawthorne.

There was no doubt as to the presence of some intra-thoracic tumour, though there was doubt as to its precise nature and seat. Within a week or two, however, malignant disease, implicating the left lung, was diagnosed: the symptoms became more pronounced as the disease advanced, and he died of exhaustion within three months from the date of his admission to hospital.

At the post-mortem examination the diagnosis was

verified. The disease in all probability had its starting point in the bronchial glands, and in extending invaded the substance of the left lung and involved the left bronchus, the left auricle, and the pericardium extensively. The left pneumogastric nerve ran into the tumour, and the left recurrent branch could be traced from the lower border up towards the side of the trachea. The left pulmonary artery was much narrowed at its origin, and coursed throughout the whole breadth of the tumour on its way to the lung. The structure of the tumour was that of a small round-celled sarcoma (lympho-sarcoma).

I had no opportunity of examining him during the period in which his voice is said to have been clear, but the regaining of the voice is readily explained. Under treatment the congested state of the mucous membrane disappeared, and the affected cord remained in the position of complete abductor paralysis, that is, it lay close to the middle line, a condition which, while it may obstruct respiration, does not necessarily affect the voice. It remained in this position for several months, during which time the voice remained clear; but as pressure on the nerve increased, the abductor fibres became implicated, and complete recurrent paralysis resulted, the affected cord assumed the cadaveric position, and the voice became husky.

Treatment.—The treatment of unilateral abductor paralysis, like the prognosis, depends upon the cause. Iodide of potassium, with or without iron and strychnine, should be administered where no very definite cause can be discovered, and if there be any evidence of syphilis, mercury should be added. Where pressure is caused by an aneurismal tumour, rigid rest in bed and the use of the iodides may be of much service.

(*b*) **Bilateral Abductor Paralysis.**—Bilateral paralysis of the **posterior crico-arytenoidei** muscles is of rare occurrence, it is an affection confined to adult life, and is more often met with in men than in women.

Etiology.—The cause may be either neuropathic or myopathic, and the neuropathic lesions may be central or peripheral. Amongst the former are included bulbar paralysis, tabes, and disseminated cerebro-spinal sclerosis; and of the peripheral sources, pressure exerted on both pneumogastrics, or on the two recurrent laryngeal branches is the most common. The pressure may be from an aneurism of the arch of the aorta, or malignant disease of the thyroid gland; and among other possible causes may be mentioned cancer of the œsophagus, fibrous goitre, and enlargement of the bronchial glands. In some rare instances it has been due to a toxic peripheral neuritis. Injury to the muscles from the accidental swallowing of a hard foreign body, or changes in the muscles following an acute inflammatory process, are the chief of the myopathic causes of this condition.

Some years ago I examined a **case**, at the request of the late Prof. George Buchanan, where there was complete bilateral paralysis of the abductors in a woman aged 58, in which the cause was malignant disease of the thyroid. The whole gland seemed infiltrated by the disease, forming a hard mass, irregular in outline, with a nodular surface, and firmly bound down to the tissues of the neck.

Symptoms.—In the early stage of compression, when the abductors alone are involved, inspiratory dyspnœa is the chief symptom. The voice in most cases is unaffected, and when it is altered it is so to a slight extent only, and usually from some accidental condition. But the patient finds that he has an increasing difficulty in breathing, especially on exertion, and after a time this inspiratory dyspnœa becomes permanent. Sleep is frequently broken by the feeling of suffocation and by the stridulous character of the breathing, which is sometimes accompanied by a loud snoring noise. Occasionally suffocative attacks occur, and the patient's difficulties are much increased if he contracts a cold or other catarrhal condition of the throat. In some cases the

respiratory difficulties are increased by direct pressure of the aneurism, or other new growth, on the trachea itself.

In making a **laryngoscopic examination** in those cases, it is necessary to carefully avoid anything which would interfere with respiration, or which might excite the patient and so induce spasm of the glottis. When the mirror is in position, and the patient breathing quietly, both vocal cords are found to lie close together during inspiration, and may be slightly separated during expiration. Inspiration is prolonged and stridulous, while expiration is short and easy. Phonation is readily performed and the note produced is clear, unless the cords be congested, when the voice will be hoarse.

Diagnosis.—The position of the cords is that of complete adduction, which might be due to spasms of the adductor muscles, to bilateral ankylosis of the crico-arytenoid articulation, or to bilateral abductor paralysis.

Spasm of the adductors is of short duration, and is accompanied by considerable distress. In cases of ankylosis there may be swelling of the arytenoids, or a history of an inflammatory affection, and usually the vocal cords in those cases remain tense, while in paralytic cases, especially if of some standing, the cords become somewhat lax. In many cases of bilateral fixation of the cords, however, it is impossible to distinguish between those due to paralysis and those due to ankylosis.

Prognosis.—Bilateral abductor paralysis is usually of serious significance. If due to a toxic peripheral neuritis or a myopathic cause, recovery may be looked for, but in all other cases it is improbable. While the condition may remain stationary for many months the risk

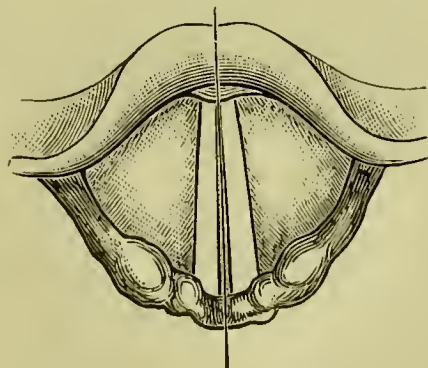


FIG. 78.—Bilateral paralysis of the abductor muscles. Both vocal cords remain practically in the middle line, both during respiration and phonation.

of sudden death from suffocation is ever present, and tracheotomy may be necessary to avert this danger.

Treatment.—Where, as in unilateral paralysis, pressure is caused by aneurism, or is due to some syphilitic lesion, the treatment must be on similar lines, and if there is any tendency to the occurrence of spasm of the glottis, bromide of potassium may be added.

If there be any toxic cause in play, the elimination of the poison must be hastened, and where the paralysis has occurred as a sequel to diphtheria, influenza, or one of the fevers, strychnine and iron should be administered and the use of the Faradic current resorted to.

Where it has followed injury to the muscles, or is accompanied by any catarrhal state, sedative steam inhalations used at frequent intervals will be found most helpful; and in cases associated with rheumatism, salicylate of sodium or the alkalies should be used.

Should difficulty of respiration be a prominent feature in the case, tracheotomy or intubation must be resorted to. If the pressure is due to aneurism and tracheotomy be chosen, the operation must be done with caution, and care must subsequently be taken to prevent the cannula causing ulceration. Intubation is to be preferred in cases due to aneurism, and in malignant cases, provided the tube can be borne by the patient.

Where the paralysis is the result of a cancerous or fibrous enlargement of the thyroid, the gland should be extirpated if possible.

III. Complete Paralysis of one or both of the Recurrent Laryngeal Nerves.

The result is a paralysis of all the muscles supplied by the recurrent laryngeal nerve affected, whether on one or both sides of the larynx.

Etiology.—Complete recurrent paralysis is a further stage of abductor paralysis, and when abductor paralysis is due to pressure on the recurrent nerve, the paralysis is not long confined to the abductor muscles. The recurrent laryngeal nerves supply the adductor as well as the abductor muscles, but it has already been pointed out that pressure on this nerve first affects the movements of the abductor muscles, and this tendency of the abductors to succumb before the adductors is the rule, and is known as “Semon’s Law.”

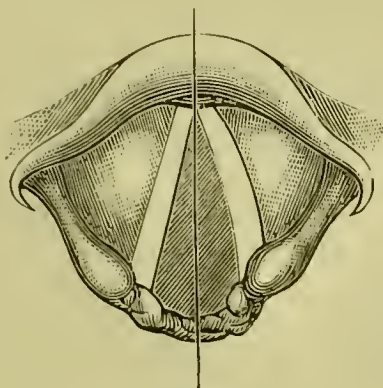


FIG. 79a.

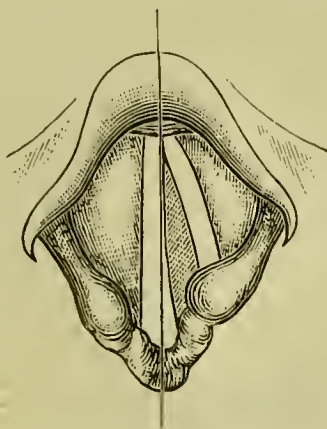


FIG. 79b.

Complete paralysis of the left recurrent nerve of some months' duration. (a) Position of the parts during quiet respiration. (b) Position of the parts during attempted phonation, showing the vocal cord on the unaffected side crossing the middle line.

Thus as the pressure on the nerve increases, whether exerted by an aneurism, tumour, or other abnormality, the adductor fibres become involved, and a complete paralysis of the recurrent nerve results.

The conditions which give rise to complete recurrent paralysis are the same as those which cause a unilateral or a bilateral paralysis of the abductor muscles.

Symptoms.—In cases of *complete unilateral paralysis* the affected cord occupies the cadaveric position, and thus it does not interfere with respiration, except during exertion; but a change in the voice is invariable.

During attempts at vocalisation the unaffected cord comes up to, and in many cases crosses the middle line in the hope of meeting its fellow, and in this way the chink of the

glottis may become oblique, and may almost be closed, but the resulting note is at best husky.

It is in this complete unilateral recurrent paralysis that the ringing "brassy" cough, so frequently associated with aneurism of the arch of the aorta, is met with. During the forcible expiratory effort constituting a cough, the glottis is not firmly closed as it is in the healthy larynx during a similar condition, and as a result the cords do not vibrate in unison.

On **examination** the paralysed cord is found to occupy the cadaveric position, that is, it remains immovable midway between abduction and adduction; and as there is also paralysis of the internal tensor, the affected cord is flaccid and its free edge forms a curve with the concavity directed

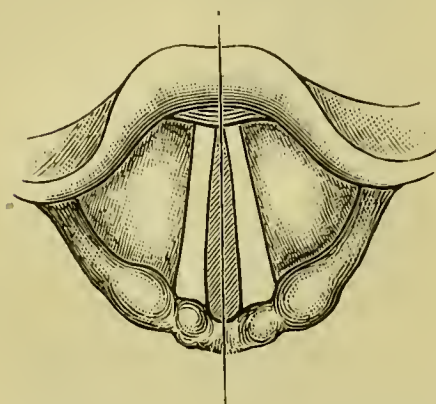


FIG. 80. — Complete bilateral paralysis. Both vocal cords remain unmoved in the cadaveric position, both during respiration and attempted phonation.

inwards. As the inter-arytenoid muscle derives its nerve supply from both recurrent nerves, the arytenoid cartilage on the paralysed side may be seen to move during both phonation and respiration.

Where there is *complete bilateral paralysis* of the recurrent nerve there is then no dyspnoea while the patient is at rest, though there is a variable degree of difficulty in breathing during exertion. The

voice, on the other hand, is wholly lost, and the patient either speaks in a quiet whisper, or the speech is rough and husky, without voice. Coughing is performed with difficulty, and is hoarse in character; and as the mucus cannot readily be dislodged, it remains adherent to the lining membrane of the larynx and its cavities, where it decomposes, and gives a fetid odour to the breath.

On laryngoscopic **examination**, in complete bilateral paralysis, each vocal cord is found to occupy the cadaveric

position, where it remains unmoved during both respiration and attempted phonation.

Diagnosis.—Cases of complete recurrent paralysis differ from those of abductor paralysis, whether unilateral or bilateral, in that the affected cord or cords remain fixed in the cadaveric position. If care be taken to observe the position of the cords in relation to the middle line all doubt will be dispelled.

In cases of fixation of the vocal cords from ankylosis, whether the cause be rheumatic, syphilitic, or inflammatory, the cord on the affected side usually remains rigid and close up to the middle line, and where both sides have been involved in the process they may be affected unequally.

Prognosis.—By the time the paralysis has become complete, such degenerative changes have occurred, both in the nerve and in the muscular structure, that there is no hope of recovering the vocal function.

The general prognosis will depend on the nature of the diseased process in operation.

Treatment.—The treatment, as in that of abductor paralysis, must be directed against the cause of the paralysis, and symptoms and complications must be combated as they arise.

No electrical treatment will help the local condition, but warm sedatives, stimulating and antiseptic inhalations are often of service in relieving irritation, in clearing away retained mucus, and in counteracting the evil effects of decomposing secretions.

IV. Paralysis of the Adductor Muscles.

(a) The muscles affected are the *lateral crico-arytenoidei*, the *arytenoideus*, and the *thyro-arytenoidei*, and when the adductor muscles alone are involved the paralysis is always **bilateral**.

Etiology.—As already described, paralysis of the adductor muscles may be caused by deep pressure on the recurrent laryngeal nerve, in which case, whether one or both sides are implicated, the affection of the adductors is secondary to paralysis of the abductors.

Cases, however, of a totally different type occur, in which the muscles of adduction are alone involved. These may be *functional* or *myopathic* in origin, and the paralysis is always bilateral.

The *functional* or *hysterical* form is met with most frequently in females, and especially between the ages of fifteen and twenty-five years. Lack of occupation, unhappy surroundings, and physical exhaustion, are the more important of the predisposing causes.

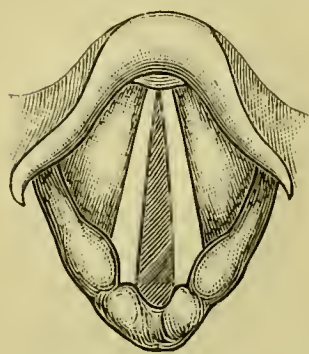


FIG. 81.—Functional or hysterical paralysis. The position of the cords is the same as seen in complete bilateral paralysis; but in this instance they are not fixed, they become more fully abducted during deep inspiration, and assume the position here shown where phonation is attempted.

The onset may be sudden, and the exciting cause may be a mental or physical shock, emotion, grief, or joy, or it may be the result of exhaustion in anæmic, neurasthenic, or phthisical girls.

In *myopathic* cases the usual determining cause is an acute inflammation of the larynx.

Symptoms.—The distinguishing symptom is aphonia, and it will be observed as the patient whispers, that there is no attempt to give voice to the words spoken, and there is an entire absence of huskiness. A patient with the will so perverted will probably refuse, for months continuously, to put forth the necessary effort to produce voice; but, while conversation is conducted in whispers, a cough or laugh, if suddenly provoked, will be found to have a vocal sound, proving the ability to close the glottis. Again, if a patient so affected be placed under the influence of chloroform, clear speech, and sometimes violent language, is made use of while

going under the influence, and again while recovering from the effects, of the anæsthetic.

On examining the larynx in a case of hysterical aphonia, the surfaces may be anæmic but otherwise the parts are normal in appearance. When the patient is asked to phonate no attempt may be made to approximate the cords, and they may remain stationary in the position of quiet respiration; or the cords may be observed to move towards the middle line, but no effort is put forth by the patient to cause them to vibrate. In some cases there may be a degree of anæsthesia of the laryngeal mucosa.

In myopathic cases, while the voice may not be wholly lost, it is of the nature of husky aphonia, and from the efforts made by the patient it is readily seen that the disability is real.

Prognosis.—The state of the patient's general health must be enquired into, and if there be no evidence of early phthisis the voice will almost certainly return. The restoration of the vocal function may be delayed for a lengthened period in some cases, and attacks of aphonia may subsequently reappear.

Treatment.—When the patient is anæmic or suffering from physical exhaustion, tonic treatment, particularly in the form of iron with strychnine, and combined where necessary with a digestive agent, with change of air, scene and occupation, should be recommended. In purely functional aphonia, the patient must be dealt with firmly, and encouraged to exercise the vocal organ.

While the larynx is being examined and while the laryngeal mirror is in position, the patient should be urged to say eh! and ah! repeatedly and more and more forcibly. By repetition and encouragement the patient may be able to phonate audibly before the examination is over. If this is done in the presence of a friend or companion the good effect is more likely to be permanent. The patient should

be firmly assured that the voice will be fully restored. This assurance gives confidence to the patient suffering from muscular enfeeblement, and in the purely functional case, the patient is made to feel that the unreality of her illness is known.

Locally, volatile stimulants, such as creosote and camphor, used in the form of a hot inhalation, are frequently of service, and the application of astringents such as glycerine of iron, glycerine of tannin, and sulphate of copper solution (15 gr. — ̄1) may hasten recovery. After every application the patient should be encouraged to use the voice more and more strongly. When these measures have been unsuccessful Faradisation should be employed. It should be used in the first instance by placing one pole firmly over the nape of the neck, and the other passed along the course of the recurrent laryngeal nerve. Its application in this fashion is often followed by most satisfactory results, particularly if the current when first applied be sufficiently strong to give a slight shock.

In more stubborn cases of purely functional aphonia, resort may be had to the laryngeal electrode. One pole is again placed over the upper cervical vertebræ, and the other pole, terminating in a M'Kenzie's laryngeal electrode, is introduced into the laryngeal cavity. By this means the vocal cords may be stimulated, and caused to contract, alternately, and the effect of one application may be permanent.

When the paralysis is of myopathic origin, the treatment is that of sub-acute laryngitis, and is chiefly in the form of stimulating steam inhalations, mild astringent solutions applied by means of a spray, and counter-irritants applied externally over the larynx.

(b) **Unilateral** paralysis of the adductor muscles does not occur apart from complete unilateral paralysis of the recurrent laryngeal nerve, in which case it occurs subsequent to

a unilateral paralysis of the abductor muscles, under which heading it has already been dealt with.

V. Paralysis of the Arytenoideus Muscle.

Etiology.—Paralysis of the arytenoideus may be of neuro-pathic origin, in which case it is almost always dependent on hysteria, or it may be, and more commonly is, myopathic in nature. Situated as it is on the posterior wall of the larynx, close to the mouth of the gullet, this muscle is specially liable to injury. It is also prone to inflammatory attacks, and it is frequently the site of tubercular lesions.

It may be paralysed in common with the other adductor muscles.



FIG. 82.—Paralysis of the arytenoideus muscle. Sketch shows the position of the vocal cords during phonation.

Symptoms.—There is a degree of hoarseness and weakness of the voice, which is explained by the inefficient closure of the glottis. On examination the appearance of the parts is characteristic. During phonation the vocal cords are fully adducted, and lie in contact throughout the greater part of their length, but posteriorly there remains a triangular chink through which air freely escapes.

If the paresis is the result of recent injury, of catarrhal inflammation, or other pathological process, evidences of the exciting cause may be observed during the examination.

Prognosis.—This will depend largely on the cause of the paralysis and the length of time it has been present. Where there is no organic disease, recovery may be looked for.

Treatment.—Where hysteria is the cause, the treatment must be conducted on the same lines as those recommended in functional aphonia; and in cases of myopathic origin, these must be dealt with according to the nature of the cause.

VI. Paralysis of the Thyro-Arytenoidei Muscles.

This form of paralysis is always bilateral, and occurs in conjunction with paralysis of neighbouring muscles.

Etiology.—The causes are similar to those which result in paralysis of the arytenoideus muscle, laryngeal catarrh and over-use of the voice being the more common.

Symptoms.—The voice is weak and hoarse, and if the patient attempts to use it much he becomes exhausted.

On **examination** the chink of the glottis during phonation is seen to be elliptical in form, the free edge of each cord being concave from lack of tension.

Prognosis.—In the majority of the recent cases recovery will take place; but where it persists for a time and the voice is not rested, the condition may remain permanently.

Treatment.—Where the paralysis is of catarrhal origin or is the result of a severe vocal strain, complete rest of the larynx is imperative, and the improvement will be hastened by the use of hot sedative steam inhalations. If the paresis has persisted for a time, a series of fly-blisters may be of service, together with the Faradic current applied carefully through the laryngeal electrode. Considerable care should be taken in the subsequent use of the voice.

II. SPASMODIC AFFECTIONS OF THE LARYNX.

There are two types of the spasmodic affections of the larynx. In the first are included cases of both tonic and clonic spasms of the adductors, and in the second are all cases resulting from changes in co-ordinated laryngeal movements.

I. LARYNGEAL SPASMS.

(a) **Spasm of the Glottis in Adults.**

Etiology.—When an irritant or foreign body is inhaled, a reflex spasm of the glottis results, through a physiological protective mechanism. But this reflex may become exaggerated, and spasm may then be excited by trifling incidents. It may be induced in some by depressing the tongue, by the inhalation of tobacco smoke, by the irritation of an elongated uvula touching the base of the tongue or the lip of the epiglottis, and, in some instances, manipulation of the *pomum Adami* may result in a laryngeal spasm. Small particles of food coming in contact with some part of the larynx, or “a drop of tea going the wrong way,” may induce an alarming spasm, and a violent spasm may be excited by the accidental entrance of a throat-pigment into the larynx during its application to the fauces or pharynx. The parts may be unduly irritable, and yet free from disease.

In some cases pressure on the pneumogastric or recurrent laryngeal nerves may cause spasm prior to the onset of paralysis. Spasm of the larynx is sometimes of hysterical origin; it may occur in connection with epilepsy; it is one of the painful features in tetanus and hydrophobia; and in *tabes dorsalis* the “laryngeal crises” is well known to physicians.

Symptoms.—These are of sudden onset, and consist of crowing inspiration, a sense of suffocation, with great distress and much mental excitement. The attack rarely leads to

unconsciousness in the adult, though it may in a child, and usually it passes off quickly.

Diagnosis.—The sudden onset, the severity of the suffocative symptoms, and a knowledge of the exciting cause, make the diagnosis easy in most cases. Where there is no very obvious cause, such as the inhalation of some irritant, the throat and chest should be carefully examined.

Treatment.—During the attack the patient becomes excited and strives to inspire. If he be made to *breathe out*, which action may be helped by a few sharp strokes with the open hand between the scapulæ, the spasm will be quickly overcome. Semon advises holding the breath for two seconds, then to breathe deeply through the nose with the mouth firmly closed. But the former method, I think, is more efficacious.

After the attack has passed, further treatment will depend on the cause. If the spasm resulted from the contact of an irritant, no subsequent treatment may be necessary. If it has been caused by an elongated uvula or a neo-plasm, these should be removed, and any unhealthy condition in the nose or naso-pharynx should be corrected. Should the spasm be caused by pressure on the nerve-trunks, the condition exciting the pressure must be dealt with, as recommended in the treatment of paralysis of the abductors. Where it is purely functional, and where there is an undue sensitiveness of the parts, much benefit will follow the occasional use of bromide of potassium; and in those cases also the use of irritants—tobacco, alcohol, and highly-spiced foods and condiments—should be forbidden to the patient.

(b) **Laryngismus Stridulus.**

This is a spasmodic contraction of the adductor muscle of the larynx, resulting in dyspnœa, which occurs in young children,

Etiology.—Any condition which increases reflex irritability acts as a **predisposing** cause, and chief amongst these are hydrocephalus, chronic cerebral affections, and rickets; while gastric disturbances, dentition, and intestinal irritation are the more common of the **exciting** causes.

The presence of adenoids in the naso-pharynx and chronic thickening of the ventricular bands may be grouped among the local predisposing causes, and whooping-cough is sometimes the exciting cause. Enlargement of the thymus gland is held by some to be the cause of laryngismus stridulus, but the resulting condition under the term "Thymic Asthma" will be referred to later.

Symptoms.—An **attack** may come on suddenly and without warning, or it may be preceded by restlessness or carpo-pedal contractions. The **symptoms** are mainly those of suffocation. There is closure of the glottis from spasm of the adductor muscles, and there may also be spasm of the diaphragm and intercostal muscles, when inspiration is arrested. Marked lividity may result, or the child may become pale and limp, and the attack may be of short duration, lasting for a few seconds only, or it may be so prolonged that death seems pending, and in some cases it may actually occur. As the spasm subsides, inspiration is resumed, and the first few efforts are accompanied by a shrill note somewhat similar to the inspiratory "crow" of whooping-cough.

Diagnosis.—There is no elevation of temperature in laryngismus stridulus, and this serves to distinguish it from those inflammatory disorders of the larynx in which spasm may be induced by the local inflammatory process.

In acute laryngitis, there is a frequent irritating cough and some affection of the voice, while in laryngismus stridulus there is neither hoarseness nor aphonia between the attacks.

Prognosis.—The early prognosis must be a guarded one, and the later prognosis will be determined by the cause

of the attack, and by the state of the child's general health.

Treatment.—The treatment of laryngismus stridulus must be considered under three heads.

(a) Treatment of the attack.

(b) Treatment directed to lessen reflex irritability.

(c) Treatment of the condition on which the occurrence of the attacks depends.

(a) During the attack the child should be held in the sitting posture, with the head slightly inclined forwards. Its clothes should be quickly loosened, and the chest and back slapped with a towel wrung out of cold water. If there is hot water at hand, the child's legs and body should be immersed in a warm bath, and the face and chest sponged with cold water. If the attack does not quickly pass, chloroform dropped on a handkerchief may be placed over the mouth and nose, or sal volatile may be held to the nostrils; and if lividity is marked, unconsciousness deep, and asphyxia seems imminent, tracheotomy must be resorted to.

(b) When an attack is threatened it may be cut short by the administration of an emetic; and the regular use of bromide of potassium, with or without belladonna, will be found most useful in lessening the frequency and in modifying the severity of the seizures.

(c) Where the attacks are due to the presence of intestinal parasites, the use of an anthelmintic may bring about a cure. Where the attacks are associated with rickets every effort must be made to improve the child's general health as far as is possible, by ensuring a plentiful supply of fresh air and sunlight, by regulating the diet, assisting digestion and attending to the state of the bowels, and in addition, preparations of lime and iron with cod-liver oil should be given. Cold sponging already recommended to be used during the paroxysm, should be employed for a considerable time after the attack. Twice daily the child should be

placed in a warm bath, and while in the sitting posture the back and chest should be freely sponged with cold water, preferably sea-water, for one minute, after which the child is removed from the bath and quickly dried.

(c) **Thymic Asthma.**

In all cases having symptoms of laryngismus stridulus, it is advisable to examine the neck in the neighbourhood of the supra-sternal notch. The thymus gland which lies close behind the sternum, and in infancy extends from the anterior mediastinum upwards to the upper border of the sternum, reaches its greatest size at about the second year, after which it ceases to grow and slowly diminishes in size. In some cases it persists much longer and in others it may become hypertrophied, and when it is hypertrophied it may exert pressure on the trachea. The symptoms of laryngismus stridulus have been attributed to pressure exerted by the enlarged thymus, and Osler says that many German writers consider thymic asthma identical with laryngismus stridulus of English authors. He, however, thinks that there can be "no question that the ordinary laryngismus seen in rickety children is a convulsive affection and is not the result of compression."

In cases of severe thymic asthma, the enlarged thymus may be removed. This has been done successfully with complete relief of the dyspnœa.

(d) **Rhythmic Clonic Spasms of the Adductor
Muscles of the Larynx.**

Rapid contractile movements of the faucial and pharyngeal muscles have already been described as "nystagmus of the pharynx," and where that condition is present it is usually accompanied by rapid rhythmical contractions of the adductors of the vocal cords.

The condition is usually the result of a serious central lesion which in most cases proceeds to a fatal issue.

II. NEUROSES OF CO-ORDINATION.

(a) **Stammering of the Vocal Cords.**

Under this title, Dr. Prosser James first described a condition apparently due to a defect in the power of co-ordinating the intrinsic muscles of the larynx. The vocal apparatus fails at intervals to carry out properly the behest of the will, and this gives rise to sudden interruptions to vocalisation, resulting in a feeble, jerky voice, or it may be, to a momentary voiceless condition, while the power of articulation remains unaffected. The same condition in its later development is described as **Phonic Spasm**. Here every attempt at phonation induces spasm of the adductors, which wholly incapacitates the singer or speaker from using the voice professionally. It may be met with in those whose general health has been reduced by some serious illness, and it occurs most frequently amongst clergymen and public singers. If careful investigation be made in the cases occurring amongst preachers it will be found that in the majority, the condition is not so much an affection of the nervous supply, as the result of improper methods employed in the production of the voice. It is especially due to the error of continuing to speak after the lungs have ceased to contain a sufficiency of air to support the necessary continuous vibration of the cords.

Treatment.—The correction of this error is the essential point in treatment. In many cases, general muscular exhaustion is probably the cause, and the aim in treatment then must be to improve, by every means, the state of the patient's health, along with a period of rest for the larynx. Where it has resulted from errors in breathing, and in the use and control of the voice, careful tuition, followed by

regulated respiratory and vocal exercises should be recommended.

(b) **Spasmodic, Nervous, or Laryngeal Cough.**

This, which is a peculiar, often intractable, cough, is occasionally met with, chiefly in children and young females. The cough is of a loud, hollow, barking character. Sometimes deep in tone, it may be frequently repeated and aggravated when attention is called to it, is unaccompanied by expectoration, and causes the patient little or no pain.

Etiology.—In the majority of cases, **no definite cause** can be discovered, and the result of an examination of the fauces, pharynx, larynx, and lungs being in most instances negative, it is presumed to be due to an increased reflex sensibility. Anæmia or atony of the fauces and elongation of the uvula may be mentioned among the exciting causes. In some cases it appears to follow whooping-cough, in others it may be looked upon as a “habit,” and not infrequently it is associated with symptoms indicative of hysteria.

The barking cough of puberty, described by Sir Andrew Clark as occurring in males, more than in females, between the ages of 16 and 20 is of a similar character.

The cough is a single short sharp cough, which occurs at fairly regular intervals during the day, but which ceases during sleep, and when the patient's attention is drawn away from himself.

Etiology.—Usually the patient is either of a neurotic temperament or is the offspring of neurotic parents, and over-feeding and coddling are exciting causes. In some cases the sharp “barking” cough is due to choreic movements of the faucial, pharyngeal, or laryngeal muscles.

Treatment.—When any local abnormality, which might be the source of irritation, is present, it should be removed,

if this be possible. It may be in the form of hypertrophied tonsils, post-nasal adenoids, or some intra-nasal lesion.

Where it is a pure neurosis unaccompanied by any evident physical change, the administration of the bromides, along with change of air and an out-of-door life, should be prescribed.

Iron and arsenic will be found of much service in anæmic cases, and in others much good will follow the use of the Faradic current, applied as in cases of functional aphonia. In very persistent cases a sea voyage may be recommended as most likely to lead to the entire disappearance of the cough.

(c) Laryngeal Chorea.

Choreic movements of the vocal cords may occur *per se*, or the muscles of the fauces and larynx may be affected in common with those of the body generally, or, as has been noted, the implication of the laryngeal muscles may precede an attack of general chorea, sometimes by a considerable interval of time.

It is sometimes difficult to see the choreic movements of the laryngeal muscles, but under favourable conditions and with patience the jerky movements characteristic of chorea, may be observed and studied both in the fauces and in the larynx. Though laryngeal chorea is somewhat intractable, it leads to no serious consequence.

Treatment.—No local treatment is usually required, but if there be any condition causing irritation it should be removed. The patient's attention should be directed away from himself, out-door games should be indulged in, and the use of general tonics, and, possibly, anti-spasmodics may be necessary. In a good many instances syrup of chloral acts beneficially.

(d) **Laryngeal Vertigo.**

The condition to which this term was applied by Clascot is characterised by an irritation in the larynx, ending in a cough, which is followed by a spasm of the glottis and giddiness, and sometimes by momentary loss of consciousness. The latter may be sufficiently prolonged to cause the patient to stagger and fall.

Etiology.—There has been much speculation as to the exact cause of the attack. By some the condition is bracketed with epilepsy, and others look upon it as analogous to Menière's disease. The giddiness is considered by some to be due to congestion of the cerebral vessels, as a result of the paroxysmal cough, which in turn leads to a disturbance of the centre of equilibrium. Others think that the symptoms may all be explained by spasm of the adductor muscles alone, as forced expiratory efforts, with the glottis firmly closed, are known to weaken and to slow the action of the heart, and if persisted in may cause vertigo and unconsciousness.

In some cases local conditions may be present, any of which might be the source of irritation, and chief amongst these are hypertrophy of the lingual tonsil: elongation of the uvula: granular pharyngitis and pedunculated laryngeal polypi; and whooping-cough in elderly people may be included amongst the causes of laryngeal vertigo.

Symptoms.—Between the attacks the patient may be perfectly well. The attack begins as an irritation, referred to the larynx, which excites a bout of coughing, and during the paroxysms of coughing the patient suddenly becomes giddy and it may be unconscious. During the latter stages he may fall to the ground, but usually recovers consciousness within a few seconds.

I have seen laryngeal vertigo more than once in elderly people who had contracted whooping-cough. The onset of

the spasm was in every respect similar to that met with in a child suffering from whooping-cough, but the kink ended with them in giddiness and temporary unconsciousness. In one case the old gentleman, who was confined to the house, received severe injuries by falling against articles of furniture during the many seizures.

Diagnosis.—In every case of laryngeal vertigo the symptoms are preceded by an attack of coughing which serves to distinguish it from an epileptiform seizure, and the absence of other symptoms of locomotor ataxy prevents laryngeal vertigo being mistaken for the laryngeal crisis of tabes.

Prognosis.—Recovery has taken place in each of the few cases I have seen. While the symptoms are alarming and their appearance and recurrence may give rise to considerable concern, the attacks, apart from the risk of consequential accidents, are not dangerous.

Treatment.—Any existing local abnormality should receive appropriate local treatment. But whether there be any local source of irritation discoverable or not, the attacks may be modified or wholly controlled by the judicious use of bromide of potassium, combined with chloral where necessary.

EUNUCHOID VOICE.

A persistent high-pitched puerile or falsetto voice in man is occasionally met with. It is not dependent on any detectable physical defect in the larynx, nor is it associated with any sexual abnormality.

In most cases it appears in some measure at least to arise from a wrong method of using the voice. Much improvement may be obtained by careful tuition begun when the puerile voice persists after the age of seventeen years.

Treatment.—The patient should be instructed to inspire deeply, and during the expiration which follows to emit a deep sonorous note. The frequent singing of deep notes,

which causes the chest to vibrate strongly, should be encouraged; and when speaking he should at first hold his head bent slightly forwards. With the head in this position the larynx is prevented from rising when the voice is used, and a lower note can thus be more easily produced.

DOUBLE VOICE.

Inequality in the vibrations of the two vocal cords during phonation, may produce a sound consisting of two notes of different pitch.

Etiology.—This condition of diplophonia, or double voice, may be temporary, as occurs in the course of a laryngeal catarrh, from the adhesion of a small pellet of mucus on the free border of one cord, or it may be of a more permanent nature. A small new growth on one vocal cord, injury to, or paresis of, a vocal cord or other abnormality which can interfere with the simultaneous and symmetrical action of the cords may result in production of double voice.

Treatment consists in the removal, where possible, of the determining cause.

CHAPTER XVIII.

MATERIA MEDICA AND THERAPEUTICS.

THROUGHOUT the preceding chapters the necessity for **constitutional treatment** in all disorders associated with or resulting from systemic disease has been insisted upon, and for the requisite details the student is referred to works on general Medicine and Surgery. Attention will here be directed chiefly to those **topical** and **special measures** which experience has shown to be most useful in combating the various abnormal conditions described in the foregoing chapters. These may be described under the headings of Gargles, Lozenges, Inhalations (including Sprays), Pigments, Powders, Intra-laryngeal Injections, and Caustics.

I. GARGLES.

Certain solutions and infusions have long been used as gargles and mouth-washes in the treatment of buccal, faucial and pharyngeal affections; but their beneficial effect, as commonly employed, is extremely doubtful, except in those cases where the parts, to which the remedy is to be applied, lie in front of the tonsils. Von Troltsch has described a method known as pharyngeal gargling, in which the patient, having taken a mouthful of the fluid, throws back the head,

and, performing the act of deglutition in an incomplete fashion, allows the liquid to pass a certain way towards the gullet, without, however, swallowing it. When the fluid lies in the pharynx the muscles of the fauces and pharynx are caused to contract, and the pharyngeal mucous membrane is bathed in the liquid. It may be stated that a good deal of practice is necessary before this manœuvre can be efficiently performed by the patient, and its efficacy in any case is doubtful.

In the act of gargling, the patient should be directed to take a full tablespoonful of the solution, and, with the head thrown well back, to keep the fluid actively moving at the back of the mouth by the gargling effort. This should be repeated three times on each occasion, thus employing close on two fluid ounces in all. In acute inflammatory affections, gargling should be discouraged, not only on account of the pain induced, but because positive harm may result. In chronic atonic conditions of the fauces, a gargle may be repeated three, four or more times a day as may be found necessary.

Gargles are divided into antiseptic, antiphlogistic, astringent, sedative, and stimulating; and in some cases a combination of substances having these several properties may be found to be advantageous. These solutions are of most service in the treatment of affections of the mouth, and in some chronic affections of the fauces.

The following formulæ are so proportioned that one ounce of the gargle, diluted with an equal quantity of water, gives the quantity, of the most generally useful strength, to be used on each occasion. This arrangement permits of the gargle being warmed, when required, by the addition of hot water. Other ingredients may be added when a combined action is desired, and the solution may be made stronger or weaker according to circumstances:

Antiseptic.

Carbolic acid, 3 grains.

Glycerine, 60 minims.

Water to 1 ounce.

Antiseptic, stimulating and slightly sedative ; useful in septic sores in the mouth and fauces.

Permanganate of potash, $\frac{1}{8}$ grain.

Water to 1 ounce.

Astringent antiseptic; useful in suppurative affections of gums.

Boracis, 20 grains.

Glycerine, 20 minims.

Water to 1 ounce.

Bland antiseptic ; useful in conditions like stomatitis.

Sanitas, 60 minims.

Water to 1 ounce.

A pleasant cleansing solution.

Sulphurous acid, 60 minims.

Water to 1 ounce.

Useful in septic conditions of the mouth and throat, and used by some as a gargle in diphtheria.

Antiphlogistic.

Bicarbonate of soda, 40 grains.

Carbonate of soda, 5 grains.

Peppermint water, 1 ounce.

In the early stage of an acute tonsillar inflammation this solution removes tenacious mucus from the inflamed surfaces, it frequently gives considerable relief from the pain, and occasionally it checks the further progress of the inflammation. It should not be gargled, but the

parts should be laved with it, or a cotton-wool swab soaked in the solution may be applied over the inflamed area.

Astringent

Glycerine of tannic acid, 1 drachm.

Water to 1 ounce.

Alum, 10 grains.

Water, 1 ounce.

Alum, 10 grains.

Tannic acid, 20 grains.

Water, 1 ounce.

Each may be found useful in atonic affections of the palate and fauces.

Stimulating.

Dilute hydrochloric acid, 18 minims.

Glycerine, 40 minims.

Water to 1 ounce.

Useful in foul or chronic sores in the mouth and fauces.

Chloride of ammonium, 10 grains.

Glycerine, 20 minims.

Water to 1 ounce.

Useful in chronic catarrhal affections of the palate and fauces.

Sedative.

Chlorate of potash, 10 grains.

Glycerine, 15 minims.

Water to 1 ounce.

Has a slightly soothing effect in cases of erosions of the buccal mucosa.

Bromide of potassium, 15 grains.

Hydrochlorate of cocaine, 1 grain.

Water, 1 ounce.

Where there is much irritability of the fauces this is useful, and in cases of great pain associated with malignant and other ulcers of the tongue, palate and fauces, it occasionally affords considerable relief.

When a stronger anæsthetic action is required, the carbolic acid gargle may be adopted, with the addition of one or two grains of cocaine, and used cautiously.

II. LOZENGES AND PASTILLES.

Lozenges and pastilles may be used as a means of introducing drugs which act either topically or constitutionally, or which combine these properties. Examples of the latter are to be found in guaiacum, aconite, and morphia lozenges. In affections of the throat, lozenges are chiefly used as local remedies, and the employment of medicaments so prepared has the advantage over their administration in solution, in that the local action may be rendered well nigh continuous by the use of a basis which dissolves slowly.

The chief excipients employed in the manufacture of lozenges are sugar, gum acacia or gum tragacanth, fruit paste, glycerine, gelatine, and liquorice. A hard lozenge may cause considerable discomfort when the parts are tender, and in some instances they may lead to serious irritation or actual erosion of the mucous membrane of the mouth. To avoid this, fruit pastes were introduced, and in many cases they answer admirably, though their use occasionally leads to gastric derangement, especially in children suffering from any febrile affection. Under these circumstances liquorice, gelatine and glyco-gelatin will be found to be more suitable. Medicated throat pastilles are of this nature, being rendered soft and demulcent by a

basis of Pâté de Jujube, while their rounded form causes the minimum amount of local irritation.

The actual making of medicated lozenges and pastilles has passed almost wholly out of the hands of the pharmacist into those of the manufacturing chemist. In the following list, which includes the better known and the most useful of the lozenges and pastilles, the name and the quantity of the active ingredient contained in each is alone given.

Trochisci guaiaci, 2 grains.

Antiphlogistic, slightly astringent and possessing a special influence over acute tonsillar inflammations in the early stage.

Trochisci cubebæ, $\frac{1}{2}$ grain.

Stimulating and astringent, and useful in catarrhal states of fauces and pharynx.

Trochisci kramerix, 3 grains.

Trochisci acidi tannici, $1\frac{1}{2}$ grains.

Trochisci catechu, 2 grains.

Rhatany, tannic acid and catechu are all useful vegetable astringents, and of the three, rhatany causes least gastric derangement.

Trochisci althxæ, 1 or more grains.

These are similar to the *pastilles de guimauve*, and are emollient and useful after removal of the tonsils or uvula.

Trochisci acid benzoici, $\frac{1}{2}$ grain.

Trochisci ammonii chloridi, 2 grains.

Stimulating in chronic catarrhal affections.

Trochisci potassii chloratis, 3 grains.

Trochisci potassii chloratis cum boraci, $1\frac{1}{2}$ grains of each.

Trochisci acidi carbolic, 1 grain.

Stimulating and antiseptic, and used in foul conditions of mouth, fauces and pharynx.

Trochisci boracis, 3 grains.

Slightly sedative and cleansing.

Trochisci cocainæ, $\frac{1}{12}$ to $\frac{1}{6}$ grain.

Analgesic. Useful to relieve pains associated with malignant disease; and in cases of dysphagia due to tubercular ulceration, one used shortly before a meal may enable the sufferer to take food with comparative comfort.

Trochisci orthoformi, 2 grains.

Analgesic, chiefly useful in cases of tubercular ulceration.

Trochisci formaldehydi.

This has recently been introduced as a lozenge with a powerful germicidal action, and thus useful in diphtheria and in septic affections of the throat.

Under the registered name of "Formamint" a lozenge containing formalin combined with menthol has had considerable vogue.

Of medicated pastilles the following may be noted :

Pastillus aconiti, with half a minim of the
B.P. tincture in each.

Useful in early acute inflammations of the tonsils, fauces
and pharynx.

Pastillus ammonii chloridi, 2 grains.

Pastillus menthol, $\frac{1}{10}$ grain.

Pastillus menthol et eucalypti (menthol $\frac{1}{20}$ grain ;
eucalyptus oil 1 minim).

Pastillus menthol, cocainæ et gummi eucalypti
(menthol, $\frac{1}{12}$ grain ; cocaine, $\frac{1}{20}$ grain ; red
gum, 2 grains).

Each of these has a stimulating effect on the mucous mem-
branes, those with red gum have astringency added, and
the cocaine in others gives the sedative action called for in
the treatment of some painful acute inflammations.

Pastillus camphoræ co.

The compound camphor pastille which in addition to $\frac{1}{4}$ grain
of camphor contains $\frac{1}{2}$ grain of benzoic acid and $\frac{1}{2}$ min.
of oil of cubebs, is a useful local stimulant in cases of
catarrhal laryngitis in voice users.

Pastillus campho-menthol grain $\frac{1}{16}$ (3 parts of menthol to
2 parts of camphor combine to form campho-menthol).
This combination is soothing, it checks excessive secretion,
and is an excellent voice stimulant.

Pastillus codeinæ comp. (codein $\frac{1}{10}$ grain, campho-menthol $\frac{1}{20}$ grain).

Stimulant and sedative; and is useful in relieving irritation of the fauces and larynx.

For a similar purpose heroin $\frac{1}{12}$ grain may be substituted for the codeine.

Pastillus orthoform comp. (orthoform 1 grain, campho-menthol $\frac{1}{10}$ grain).

Is a safe and not unpleasant analgesic after operations on the throat, and in painful conditions of the fauces, pharynx and larynx.

When lozenges are distasteful to the patient, a similar beneficial local action may be obtained in an agreeable fashion by mixing the drug with powdered sugar, *e.g.*,

Chlorate of potash, 1 drachm.

Biborate of soda, 1 drachm.

Finely powdered sugar, 2 drachms.

Friction should be avoided in the process of mixing these ingredients. Of this mixture as much as will lie on a sixpence may be placed on the tongue, and the dose repeated at frequent intervals.

III. INHALATIONS.

These are divided into moist, dry, atomised, and fuming inhalations, according to the method of their application.

(a) **Moist Inhalations.**—Steam has been referred to as a useful inhalation in diphtheria, and it forms the vehicle in all moist inhalations. Moist inhalations are sub-divided into hot and cold, according to the temperature of the water employed, and this in turn is determined by the readiness with which the drug to be used becomes volatilised. The

simplest of the specially manufactured apparatus for these inhalations is Maw's Inhaler; but in many cases a cylindrical quart jug answers just as well, and it has this advantage, that the patient may inhale the medicated steam through both nose and mouth, whereas in the former, while the mouth is applied to the orifice of the inhaler, breathing may be, and often is, conducted by the nose alone—an error against which patients should be warned. A moist inhalation should only be employed for from three to five minutes on each occasion, and the patient should be instructed not to go out of doors for at least two hours after its use.

In the following illustrative formulæ the proportions are those necessary to make one ounce of fluid, of which a teaspoonful is added to one pint of water, varying in temperature from 100° to 180° F., for each inhalation. When essential oils are prescribed they may be dissolved in rectified spirits, or combined with an alcoholic preparation such as a tincture; or the oil may be triturated with light carbonate of magnesia, in the proportion of from half to one grain of magnesia to each minim of oil, and after these have been well mixed, water is slowly added. The result is a creamy fluid freely miscible with water.

Sedative.

Oil of hops, 8 minims.

Light carbonate of magnesia, 8 grains.

Water to 1 ounce.

Directions. Add a teaspoonful to Maw's inhaler, or to a quart jug, half filled with water, about 180° F., and use as inhalation for five minutes.

Compound tincture of benzoin, 1 ounce.

Directions. Same as above.

Sedative and stimulating.

Spirits of camphor, 60 minims.

Compound tincture of benzoin to 1 ounce.

Directions. Same as above.

Spirits of camphor, 60 minims.

Carbolic acid, 40 minims.

Compound tincture of benzoin to 1 ounce.

Directions. Same as above.

Stimulant.

Oil of eucalyptus, 20 minims.

Light carbonate of magnesia, 10 grains.

Water to 1 ounce.

Directions. Same as above.

Menthol, 15 grains.

Rectified spirits, 2 drachms.

Light carbonate of magnesia, 8 grains.

Water to 1 ounce.

Directions. Same as above.

Oil of cassia, 8 minims.

Light carbonate of magnesia, 4 grains.

Water to 1 ounce.

Directions. Same as above.

Astringent.

Oil of cubebs, 40 minims.

Light carbonate of magnesia, 20 grains.

Water to 1 ounce.

Directions. Same as above.

Terebene, 40 minims.

Light carbonate of magnesia, 20 grains.

Water to 1 ounce.

Directions. Same as above.

Antiseptic.

Oil of creosote, 60 minims.

Light carbonate of magnesia, 30 grains.

Water to 1 ounce.

Directions. Same as above.

Iodine, ammonia, oil of peppermint, pine oil, etc., may be similarly employed as antiseptics and stimulants; and chloroform, conium, and hydrocyanic acid as sedatives.

(b) **Dry Inhalations.**—These are made use of after the method introduced by Dr. Coghill of Ventnor. The apparatus consists of an oro-nasal respirator in which there is a piece of sponge or other absorbent material. The volatile medicament is dropped on the sponge, and the inspired air passes over it on its way to the lungs.

This method is of great service in the treatment of chronic affections of the larynx, and as an adjunct to other forms of treatment in cases of tubercular laryngitis. The drugs so employed must be volatile at ordinary temperatures, such as creosote, carbolic acid, iodine, thymol, eucalyptus, and many other essential oils. These are dissolved in rectified spirits, and may be used separately or in combination, according to circumstances.

A useful combination in phthisis cases is the following:

Tincture of iodine, 2 drachms.

Oil of creosote, 2 drachms.

Spirits of chloroform to 1 ounce.

Directions. Put from 10 to 15 drops on the sponge of the oro-nasal respirator, and let the respirator be worn for as long a time each day as possible, the drops being renewed three or four times daily. The respirator should not be worn while the patient is asleep.

(c) **Atomised Inhalations.**—In this form, the drug used is applied in a finely divided state by means of a spray-producer.

Atomised inhalations are mainly employed for the application of solutions of non-volatile substances, such as lactic acid, permanganate of potash, salts of iron, copper, zinc, etc.; and of oily preparations, such as olive oil, and liquid vaseline, alone or with some active medicament in solution. Where solutions of metallic substances are used, the spray-producer or atomiser should be an “all-glass” one to prevent corrosion and blockage of the tubes.

The following solutions will be found of much service in the treatment of various affections of the fauces, pharynx and larynx.

Astringent.

Sulphate of zinc, 10 to 20 grains.

Distilled water, 1 ounce.

Perchloride of iron, 5 grains.

Glycerine, 20 minims.

Distilled water to one ounce.

Both are useful in the treatment of atonic conditions of the faucial and pharyngeal mucosa.

Antiphlogistic.

Borax, 6 grains.

Bicarbonate of soda, 10 grains.

Glycerine and carbolic acid, 10 minims.

Water to 1 ounce.

Relieves the local discomfort associated with acute inflammatory conditions of the fauces, pharynx and larynx. Its action is enhanced if the solution is used while it is warm.

Antiseptic.

Carbolic acid, 10 grains.

Glycerine, 60 minims.

Water to 1 ounce.

Salicylic acid, 5 grains.

Borax, 6 grains.

Distilled water, 1 ounce.

Useful in the treatment of septic conditions of the mouth and throat.

Stimulating and Antiseptic.

Chloride of zinc, 10 grains.

Hydrochloric acid, 2 minims.

Distilled water to 1 ounce.

Useful in the treatment of foul and indolent sores in the mouth or throat.

Sedatives.

Hydrochlorate of eucaine, 48 grains.

Sulphate of sodium, 10 grains.

Distilled water, 1 ounce.

(= 10 % solution.)

Hydrochlorate of cocaine, 48 grains.

Saturated solution of boracic acid, 1 ounce.

(= 10 % solution.)

Menthol, 10 grains.

Hydrochlorate of cocaine, 5 grains.

Oleic acid, 10 minims.

Parolein to 1 ounce.

Useful for the relief of pain in acute inflammation of the fauces, pharynx and larynx.

Orthoform, 3 grains.

Rectified spirits of wine, $\frac{1}{2}$ ounce.

Water to 1 ounce.

Is of considerable service in relieving the pain in cases of tubercular ulceration of the larynx.

(*d*) **Fuming Inhalations.**—These primarily consist of the inhalation of smoke produced by the ignition of **nitrated paper**, and they have long been resorted to in the treatment of spasmodic affections of the respiratory tract, *e.g.* asthma. The material is prepared by soaking unsized paper, such as

white blotting-paper, in a watery solution of nitrate of potash, of a strength varying from 30 to 60 grains to an ounce. After being dried the paper is cut into strips, when it is ready for use; or it may be further medicated by the addition of such volatile drugs as camphor, tincture of benzoin, oil of sandal-wood, stramonium, etc. When ignited, the paper should be placed in a jar, and the smoke which rises from the slow-burning paper is inhaled by the patient.

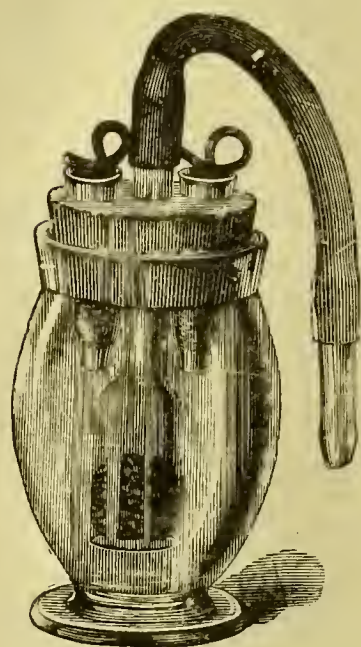


FIG. 83.—Godfrey's chloride of ammonia inhaler.

For similar purposes the drug may be mixed with nitrate of potash to form an incense or slow-burning powder. Stramonium is in this way largely used, and, combined with nitrate of potash, forms the basis of most of the so-called "asthma-powders."

The vapour of **chloride of ammonium**, which is sometimes employed in the treatment of catarrhal states of the nasopharynx, may be described as a fuming inhalation. The apparatus by which it is generated consists of three chambers, for hydrochloric acid, liquid ammonia, and water

respectively. These are so connected that, while being used, the fumes from the first two meet in the third, and combine to form chloride of ammonium, which, after being purified by passing through the water contained in the third chamber, is inhaled. This nascent vapour may be used by itself, or it may be made the vehicle for the inhalation of other volatile drugs.

IV. PIGMENTS.

A large variety of substances in solution are employed for purposes of topical application, chief amongst which are the glycerines of the B.P., and watery solutions of the mineral astringents. These latter, in weak solutions, are employed as stimulants to indolent sores, and in stronger solutions as astringents. Nitrate of silver, in addition to being an astringent, acts as a protective agent, as it forms a thin layer of the albuminate of silver over the surface to which it has been applied.

The following are some of the more important substances used for direct application :

Sulphate of copper, 10 to 20 grains to 1 ounce of water.

Alum,	-	-	-	60 grains	„	„
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Perchloride of iron,	30	to	60 grains	„	„
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Sulphate of iron,	-	60 grains	„	„
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Nitrate of silver,	10	to	40 grains	„	„
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Chloride of zinc,	-	15 grains	„	„
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Chromic acid,	-	30	to	60 grains	„	„
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In the treatment of tertiary ulcers of the mouth, fauces, pharynx and larynx, and in lupus ulcerations of those parts, a much stronger solution of chromic acid, consisting of one part of the acid to two parts of water, will be found to be of great service in checking the further spread of the disease, and in hastening the healing process.

In addition to these, liniment of iodine ; menthol, 20 per cent. in olive oil ; camphor-chloral, camphor-thymol, made by rubbing together equal parts of the two ingredients, form useful topical aids to treatment.

In the treatment of chronic follicular tonsillitis where the tonsils are not enlarged, but secretion is retained in the follicles, the following is useful :

Guaiacol, 100 grains.

Oil of sweet almonds, 1 ounce.

Pigments may be applied by means of a hair-pencil, but a pledget of absorbent cotton wool, twisted round a probe or cotton-holder, is to be preferred, and, as the swab is specially made for each separate application, it is free from all risk of conveying infective material.

For purposes of producing *anæsthesia* of the fauces, pharynx, or larynx, hydrochlorate of cocaine is now freely employed. The strength of the solution selected will depend on the object aimed at. In cases where the fauces and pharynx are unduly irritable, the hyper-sensitiveness may be removed by gently painting the surfaces with a five per cent. solution. But when deep *anæsthesia* is desired, such as is necessary for operative purposes, then a fifteen to twenty per cent. watery solution should be employed.

The solution may be sprayed over the surface generally, but if it be applied in this way a larger surface is *anæsthetised* than is called for, to the greater discomfort of the patient. It is better to apply the cocaine solution by

means of cotton-wool swabs soaked in the solution, by which it is rubbed firmly over the area to be anæsthetised. The action of the drug is thus limited, and the anæsthesia is more complete.

V. POWDERS FOR INSUFFLATION.

Powders may be applied to the interior of the larynx by Kabierskie's insufflator; but as it is necessary in most

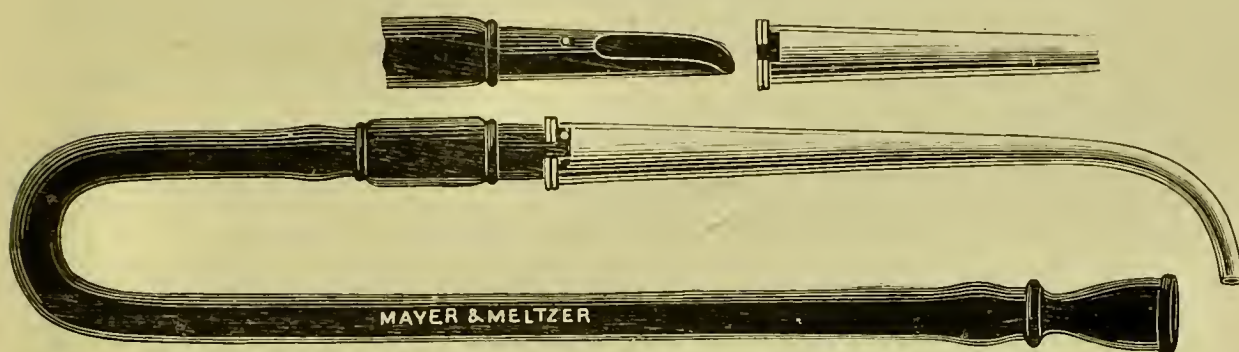


FIG. 84.—MacDonald's powder insufflator.

cases to have the quantity to be introduced accurately measured, MacDonald's insufflator is to be preferred.

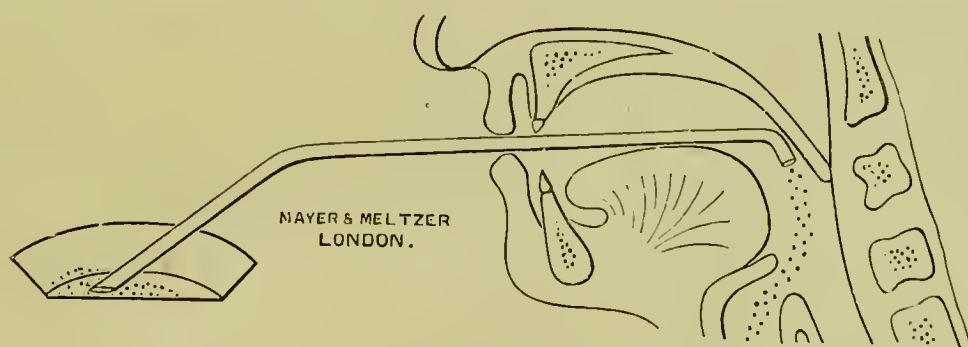


FIG. 85.—Leduc's auto-insufflator, and method of using it.

A patient may himself apply a medicated powder over and into the larynx by means of Leduc's auto-insufflator, the method of using which is seen in Fig. 85.

Orthoform. q.s.

Resorcin, 2 drachms.

Orthoform to 1 ounce.

These are useful as sedatives and healing applications when applied over an ulcerated surface in cases of laryngeal tuberculosis.

Aristol, 2 drachms.

Powdered boracic acid to 1 ounce.

Iodol, 5 grains.

Powdered sugar of milk to 1 ounce.

Finely powdered iodoform, 5 grains.

Powdered sugar of milk to 1 ounce.

These are useful in the treatment of septic and malignant ulcers of the upper respiratory tract.

VI. INTRA-LARYNGEAL INJECTIONS.

The method of giving an intra-laryngeal injection is described under the treatment of laryngeal tuberculosis.

Menthol, 60 grains.

Guaiacol, 15 grains.

Liquid vaseline or olive oil, 1 ounce.

Of much service in the treatment of laryngeal and pulmonary phthisis.

Creosote, 2 drachms.

Parolein to 1 ounce.

Guaiacol crystals, 120 grains.

Oil of sweet almonds to 1 ounce.

Useful in cases of chronic tracheitis and in bronchiectasis.

VII. CAUSTICS.

For purposes of destroying hypertrophied tissues and for removing new growths, the **electric cautery**, and many **chemical caustics** are made use of.

Electric cautery.—For this purpose the supply of electric energy may be obtained from primary batteries: from accumulators charged by a dynamo, or from the main; or the current may be taken direct from a main supply, reduced as may be necessary, through the intervention of a transformer.

The cautery point consists of a piece of platinum wire soldered to two insulated copper wires. The platinum portions vary in size and thickness and are shaped according to the object aimed at in their use—flattened and sharp-edged for cutting, pointed for puncturing, and flat or in the form of a coil for destroying a larger surface. When about to be used the point chosen is fixed to a handle furnished with a contact point, pressure on which, when the apparatus is connected with the battery, completes the circuit and the platinum point becomes hot.

Of **chemical caustics**, solid nitrate of silver, chromic acid and trichlor-acetic acid are the chief.

In the application of the latter, great care should be taken to limit the action of the caustic acid, and prior to the use of these it is well to have the parts anæsthetised with cocaine.

For the destruction of hypertrophied tonsils, a mixture of caustic soda and unslaked lime in equal parts was frequently used prior to the introduction of the electric cautery. It was made into a paste (London paste) when about to be used, and it was applied to the open follicles by means of a spatula.

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